CLIMATE ACTION PLAN

TOWN OF TIBURON

APRIL 2011

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1. INTRODUCTION

1.1 Purpose of the Climate Action Plan

The Town of Tiburon understands that climate change has the potential to significantly affect Tiburon's residents and businesses, as well as other communities around the world. The Town also recognizes that local governments can play a strong role in reducing greenhouse gas emissions and mitigating the potential impacts of climate change.

The purpose of this Climate Action Plan, which is advisory in nature, is to compile existing and potential strategies (i.e., actions, projects, and programs) that the Town's government operations and the community can take to address climate change. It provides a brief background on what climate change is and its potential impacts, but focuses on the efforts Tiburon can take to reduce its greenhouse gas emissions and mitigate, to the extent feasible at the local level, the potential impacts of climate change.

Through actions outlined in this plan, such as increasing energy efficiency in buildings, encouraging less dependence on the automobile, and using clean, renewable energy sources, the community can experience lower energy bills, improved air quality, reduced emissions, and an enhanced quality of life. The Town's preparation of a 2005 Greenhouse Gas Emissions Inventory and this Climate Action Plan are the beginning of an ongoing planning process that includes assessing, planning, mitigating and adapting to climate change.

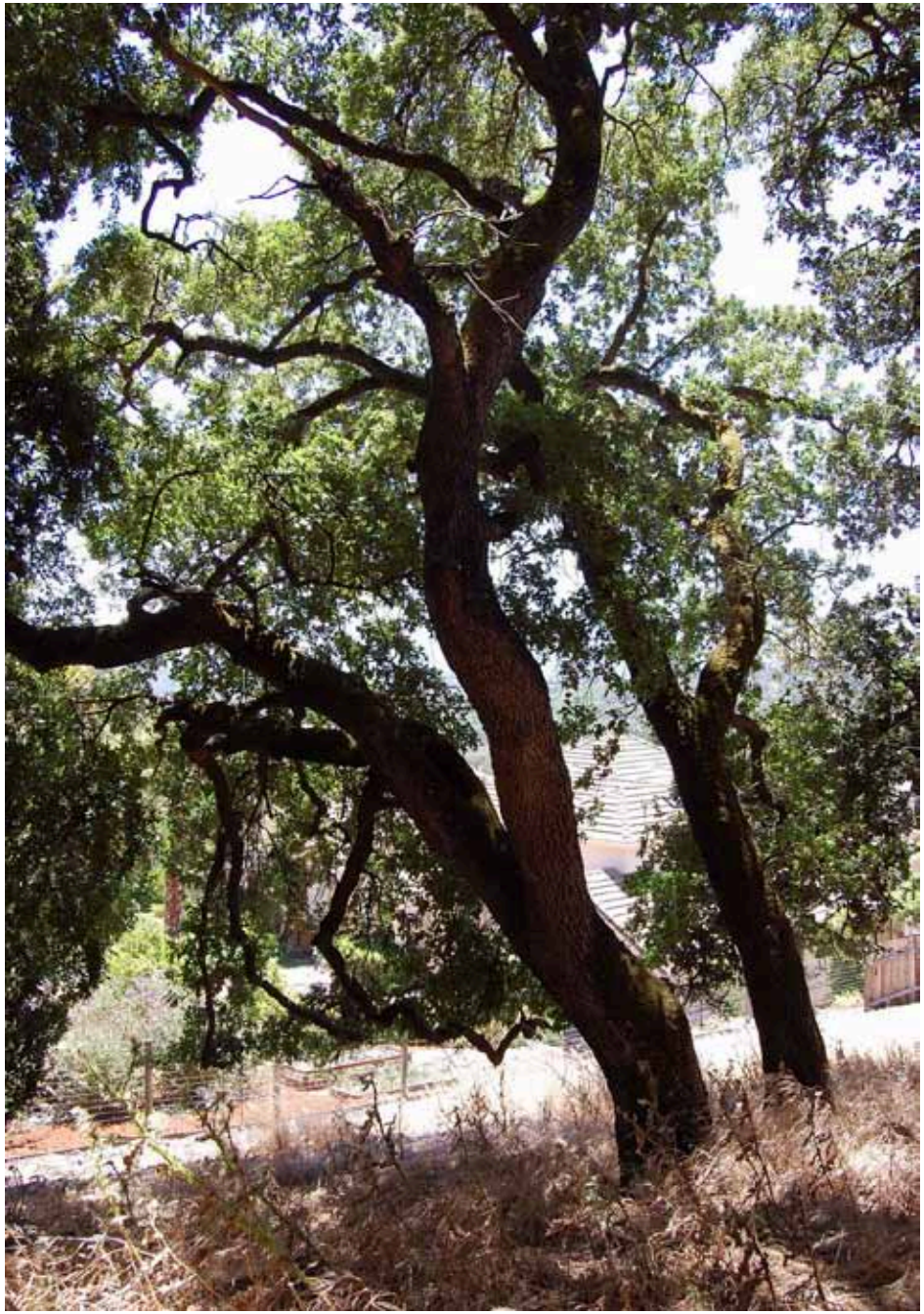
Specifically, this Plan does the following:

- Summarizes the various regulations at the federal, state, and regional levels.
- Incorporates the Town's 2005 Greenhouse Gas Emission Inventory, which identified sources of greenhouse gas emissions generated by both the community and the Town's government operations.
- Estimates how these emissions may change over time and establishes a target to reduce greenhouse gas emissions to 15% below 2005 levels by 2020.
- Provides natural system, energy use, transportation, land use, green purchasing, waste and water use strategies necessary to minimize Tiburon's impacts on climate change and meet the established greenhouse gas emissions reduction target.

1.2 Relationship to the General Plan

Many of the goals, policies and programs of the Tiburon General Plan 2020 support the vision for a sustainable community that minimizes its impact on the environment. In the downtown, the General Plan policies seek to encourage mixed-use and affordable housing, and local-serving uses and facilities which would reduce reliance on the automobile and decrease transportation emissions. Policies and programs are also in place to improve the Town's pedestrian and bicycle network and provide facilities and incentives to encourage alternative transportation throughout Tiburon.

Though both the General Plan and the Climate Action Plan are intended as long-range plans, the Climate Action Plan may be updated on a more regular basis to add and amend strategies as new information, policy guidance, and regulations regarding climate change evolve, and new technologies to address it are developed. It is intended that a future update of the Tiburon General Plan will integrate and reference this plan, instead of including the plan in the General Plan itself.



1.3 Climate Change Background

A balance of naturally occurring gases dispersed in the atmosphere determines the Earth's climate by trapping infrared radiation (heat), a phenomenon known as the "greenhouse effect". Significant evidence suggests that human activities are increasing the concentration of these gases (known as "greenhouse gases" or GHG) in the atmosphere, causing a rise in global average surface temperature and consequent global climate change. The greenhouse gases include carbon dioxide, methane, nitrous oxide, halocarbons, ozone, and water vapor. Each one has a different degree of impact on climate change. To facilitate comparison across different emission sources with mixed and varied compositions of several GHG, the term "carbon dioxide equivalent" or CO_2e is used. One metric ton of CO_2e may consist of any combination of GHG, and has the equivalent Global Warming Potential (GWP) as one metric ton of carbon dioxide (CO_2). According to the U.S. Environmental Protection Agency's April 2009, "Inventory of U.S. Greenhouse Gas Emissions," the majority of GHG emissions comes from fossil fuel combustion, which in turn is used for electricity, transportation, industry, and heating, etc.

Collectively, these gases intensify the natural greenhouse effect, causing global average surface temperatures to rise, which affects local and global climate patterns. These changes in climate are forecasted to manifest themselves in a number of ways that might impact Tiburon as well as other changes to local and regional weather patterns and species migration.

According to a 2006 Summary Report from the California Climate Change Center, global warming could significantly impact California water and forest resources. The Center's 2006 Summary Report noted the following findings and potential risks to California[1]:

- Precipitation is the most important hydrologic variable and most difficult to forecast.
- Warming raises the elevation of snow levels with reduced spring snowmelt and more winter runoff.
- Less snowmelt runoff means lower early summer storage at major foothill reservoirs with less hydroelectric power production.
- Higher temperatures and reduced snowmelt compounds the problem of providing suitable cold-water habitat for salmon species.
- Rising sea levels would adversely affect many coastal marshes and wildlife reserves.
- Higher temperatures increase the demand for water by plants.
- Climate change in California will result in a higher frequency of large damaging fires.
- Regional climates that are hotter and drier will result in increased pest and insect epidemics within California's forests.

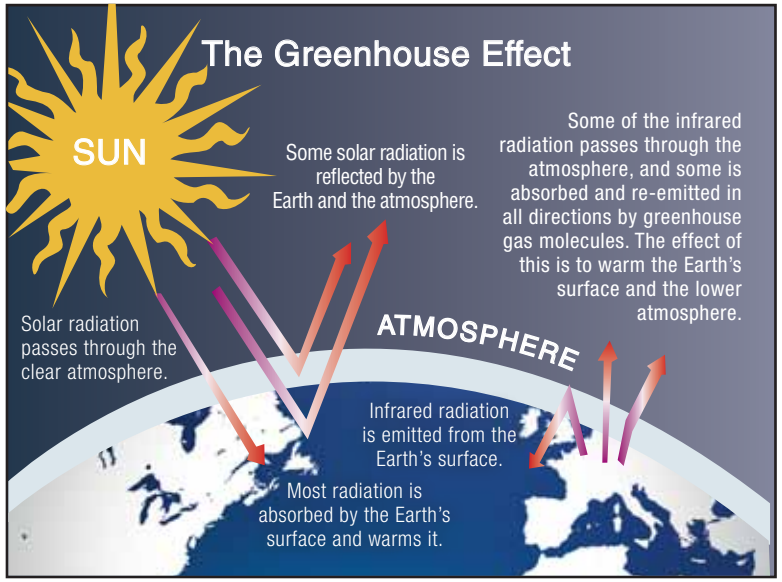

The Greenhouse Effect
SUN
Some solar radiation is reflected by the Earth and the atmosphere.
Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.
Solar radiation passes through the clear atmosphere.
ATMOSPHERE
Infrared radiation is emitted from the Earth's surface.
Most radiation is absorbed by the Earth's surface and warms it.

Figure 1: The Greenhouse Effect

1 A Summary Report from: California Climate Change Center. Our Changing Climate: Assessing the Risks to California. Document No. CEC-500-2006-077. July 2006. http://www.energy.ca.gov/2006publications/CEC-500-2006-077/CEC-500-2006-077.PDF, accessed 3/22/10.

Sea Level Rise

Because of scientific uncertainties, it is difficult to predict with a high degree of accuracy the sea level rise that will impact Marin County residents. The San Francisco Bay Conservation and Development Commission's (BCDC) most recent assessment assumes a 1.8° to 5.4° F (1° to 3° C) rise in global temperature over the next century and a corresponding sea level rise in San Francisco Bay of 16 inches by mid-century and 55 inches by 2100.[2] Sea level rise of this magnitude would have dramatic impacts on residences, businesses, schools, and public infrastructure located near the shoreline. Inundation maps created by BCDC (see Figure 2) integrate GIS data from the USGS and sea level rise projections to assess the vulnerability of Bay Area communities to different sea level rise scenarios. A 16-inch rise in sea level would result in the flooding of 180,000 acres of shoreline, which is roughly equivalent to today's 100-year floodplain. A 55-inch rise in sea level would flood over 213,000 acres of shoreline, putting billions of dollars of private and public development at risk. Changes in climate and sea level could cause an increase in storm activity, storm surges, and even greater flooding.

Figure 2: Inundation Effect of 16-Inch Sea Level Rise

The areas in blue identify the land area that is subject to inundation from a 16-inch rise in sea level.

SOURCE:
http://www.bcdc.ca.gov/planning/climate_change/maps/16/cbay_north.pdf; Inundation data from Knowles, 2008. Aerial imagery is NAIP 2005 data. Accessed 7/2/10.
DISCLAIMER: Inundation data does not account for existing shoreline protection or wave activity. These maps are for informational purposes only.

2 San Francisco Bay Conservation and Development Commission Draft Staff Report, "Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline," April 7, 2009, http://www.bcdc.ca.gov/proposed_bay_plan/bp_1-08_cc_draft.pdf, accessed 3/30/10.

In Tiburon, a 16-inch rise in sea level would impact the downtown and Keil Cove in the unincorporated area. As shown in Figure 3, a 55-inch sea level rise would inundate a greater area in the downtown and Blackie's pasture. Paradise Cay in the County's jurisdiction would also be at risk from inundation.

Figure 3: Inundation Effect of 55-inch Sea Level Rise

The areas in blue identify the land area that is subject to inundation from a 55-inch rise in sea level.

SOURCE: Inundation data from Knowles, 2008. Additional salt pond elevation data by Siegel and Bachand, 2002. Aerial imagery is NAIP 2005 data.

DISCLAIMER: Inundation data does not account for existing shoreline protection or wave activity. These maps are for informational purposes only. Users, by their use, agree to hold harmless and blameless the State of California and its representatives and its agents for any liability associated with its use in any form. The maps and data shall not be used to access actual coastal hazards, insurance requirements, or property values or be used in lieu of Flood Insurance Rate Maps issued by the Federal Emergency Management Agency (FEMA).

1.4 Climate Change Mitigation Activities in Tiburon

The Town has taken a number of initiatives in recent years to reduce greenhouse gas emissions. These include the following early actions:

1. The Town purchased two hybrid vehicles – a Honda Civic Hybrid for use by the Building Inspector, and a Ford Escape Hybrid for the parking enforcement officer.

2. The Police Department has purchased four fuel-efficient vehicles. The new Dodge Chargers use only four cylinders while idling, but can switch to eight cylinders in the "pursuit ready" mode. The Police Department plans to phase these fuel-efficient models into the police fleet as vehicles are replaced. Two of the Town's five patrol cars are currently Dodge Chargers, with purchase of another two Dodge Chargers in the works.

3. The Town installed a 158-panel photovoltaic system, rated at 22KW output, on top of Town Hall in 2006.

4. Working with funding from the Safe Routes to School program, the Town has implemented a bicycle and pedestrian project to improve accessibility and safety surrounding Del Mar Middle School through the following improvements:
   a) New pedestrian bulb-out beginning at Tiburon Blvd. and extending east along the north side of Avenida Miraflores towards the Del Mar School driveway entrance.
   b) New yellow ladder crosswalks at:
   - Tiburon Blvd. @ Lyford Drive (north, east and south) – only yellow outlines exists at these crosswalks
   - Tiburon Blvd. @ Rock Hill Drive (north) – only yellow outline exists at this crosswalk
   - Tiburon Blvd. @ Avenida Miraflores (north & 2 on the east side) – only yellow outlines exist
   - Tiburon Blvd. @ Pine Terrace (west) – only yellow outlines exist

   c) Repaint ladder crosswalks at:
   - Tiburon Blvd. @ Trestle Glen (one existing painted white)
   - Tiburon Blvd. @ Stewart Drive (one existing on south side painted white)
   - Avenida Miraflores @ Hilary Drive (two existing yellow)
   - Avenida Miraflores @ Felipa Court (three existing yellow)
   - Rowley Circle @ Hilary Drive (one existing yellow)
   - Howard Drive @ Hilary Drive (one existing yellow)

   d) Upgraded existing sidewalk ramps for ADA compliance with the incorporation of yellow truncated domes:
   - Tiburon Blvd @ Stewart Drive (two ramps)
   - Tiburon Blvd. @ Avenida Miraflores and Pine Terrace (seven ramps)
   - Hilary Drive @ Rowley Circle (two ramps)
   - Avenida Miraflores @ Felipa Court (three ramps)
   - Tiburon Blvd. @ Rock Hill Drive (two ramps)
   - Tiburon Blvd. @ Lyford Drive (six ramps)

5. Working with funding through the Non-Motorized Transportation Pilot Program, which is intended to increase the mode share of cycling and walking for everyday transportation, the Town has made the following improvements:
   a) Rehabilitated the existing walking path at Lower Raccoon Lane from Centro West Street to Mar West Street by upgrading the surface of the path, improving the surface drainage, adding stairs and handrails at the steepest locations, and providing new landscaping.
   b) Rehabilitated the existing walking path at Cayford Drive by upgrading the surface with a more stable, firm and durable surface, and provided an ADA ramp.
   c) Rehabilitated the pedestrian steps and walking path from Jefferson Drive to Reed Ranch Road, by replacing the existing wood and asphalt steps with new concrete steps and installing new handrails

6. The Town has purchased numerous pieces of Energy Star-rated computer equipment to phase out older, less energy-efficient equipment.

7. In 2008, the Town adopted a Green Building Ordinance (Ord. No. 512 N.S.) which outlined minimum GreenPointTM building thresholds for new residential structures and additions, and minimum LEED standards for new commercial structures and additions, as well as all Town-sponsored facilities. In 2011, this ordinance was retracted as new CalGreen standards were released.

8. In 2011, the Town adopted the new CalGreen standards as part of the new California Building Code, and began to consider drafting an amendment to CalGreen , with updated thresholds based on the work of the Building Energy Retrofit and Solar Transformation Committee (BERST), a countywide committee organized by the City of San Rafael, to update and unify green building standards for the County; this update will most likely be added as an amendment to CalGreen in 2011/2012.

9. In 2005, the Town adopted Resolution 05-2005 to create a policy to encourage the installation of solar collector panels, while still protecting and maintaining the valued aesthetic qualities which make the Town unique. This policy waived the building permit fees associated with the installation of flush-mounted roof solar panels that meet certain guidelines.

10. In 2008 the Town adopted Enhanced Energy Efficiency Standards (Ord. No. 506 N.S.) which requires single-family dwellings greater than 3,500 square feet to comply with more restrictive energy standards than what is normally required by the California Energy Code. In 2011, this ordinance became an amendment to the adopted CalGreen standards.

11. The Town adopted the Town of Tiburon Bicycle and Pedestrian Master Plan Update in 2008 which outlines future bicycle and pedestrian improvement programs and projects throughout the Town to promote increased bicycle and pedestrian travel and decrease the use of vehicles.

12. The Town joined the Marin Energy Authority and chose Marin Clean Energy electricity with a minimum 25% (light green) renewable energy source content for all Town operations.

1.5 Regulation of Climate Change – Federal, State and Regional Levels

Federal Climate Policy

Currently, there is no federal legislation mandating comprehensive greenhouse gas emission reporting or reduction in the United States. Efforts, however, are underway in Congress to develop and enact climate and energy legislation. The U.S. House of Representatives passed a GHG emissions cap-and-trade bill, Waxman-Markey, in June 2009. The U.S. Senate considered, but failed to pass, various cap-and-trade bills in 2009 and 2010.

Absent congressional action, the U.S. Environmental Protection Agency (EPA) has used its rulemaking authority under the Clean Air Act to begin to regulate greenhouse gas emissions. In 2009, the EPA made an "endangerment finding" that GHGs threaten the public health and welfare of the American people.[3] This finding provided the statutory prerequisite for EPA regulation of GHG emissions from motor vehicles and has led to a number of GHG regulations for stationary sources. In May 2010, the EPA issued a "tailoring" rule that enables the agency to control GHG emissions from the nation's largest GHG sources, including power plants, refineries, cement production facilities, industrial manufacturers and solid waste landfills, when these facilities are newly constructed or substantially modified. The EPA reports that its GHG permitting requirements will address 70% of the national GHG emissions from stationary sources.[4] These rules went into effect in January 2011.

In April of 2010, the Environmental Protection Agency and Department of Transportation finalized new fuel efficiency standards for model year 2012 through 2016 cars and light trucks. These vehicles will have to meet a combined average emissions level of 250 grams of carbon dioxide per mile, or the equivalent to 35.5 miles per gallon (MPG), up from the current standard of 27.5 MPG. The EPA and the Department of Transportation are currently developing first-ever regulations for medium and heavy-duty vehicles.[5]

State Climate Policy

California produces roughly 1.4 percent of the world's and 6.2 percent of the total U.S. greenhouse gases (GHG). The State of California has taken the lead in setting specific targets for reducing greenhouse gas emissions from the burning of fossil fuels in both power plants and vehicles through the following legislation:

California Solar Initiative Program, 2006. Comprehensive $2.8 billion program that provides incentives toward residential and commercial solar development over 11 years.

3 Final Rule, EPA, Endangerment and Cause or Contribute Findings for Greenhouse Gases Under the Clean Air Act, 74 Fed. Reg. 66495 (Dec. 7, 2009).
4 Final Rule: Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule Fact Sheet, EPA, http://www.epa.gov/NSR/documents/20100413fs.pdf.
5 U.S. Environmental Protection Agency, http://www.epa.gov/oms/climate/regulations.htm#1-1, accessed 12/9/10.

Senate Bill 1078 Sher, 2002. Established a Renewable Portfolio Standard requiring electricity providers to increase purchases of renewable energy resources by 1% per year until they have attained a portfolio of 20% renewable resources.

Executive Order S-21-09. In September 2009, California Governor Arnold Schwarzenegger signed an executive order directing the State's Air Resources Board to adopt regulations increasing California's Renewable Portfolio Standard (RPS) to 33 percent by 2020. The RPS will apply to investor-owned utilities, publicly-owned utilities, direct access providers, and community choice aggregators, including Marin Energy Authority.

Assembly Bill 1493 Pavley, 2002. Requires the California Air Resources Board (CARB) to develop and adopt regulations that achieve the maximum feasible reduction of greenhouse gasses from vehicles primarily used for non-commercial transportation by January 2005. In 2009, CARB adopted final regulations that are expected to reduce GHG emissions from California passenger vehicles by about 22 percent in 2012 and about 30 percent in 2016.

Senate Bill 1771 Sher, 2000. Requires the California Energy Commission (CEC) to prepare an inventory of the State's greenhouse gas emissions, to study data on global climate change, and to provide government agencies and businesses with information on the costs and methods for reducing greenhouse gases. Also establishes the California Climate Action Registry to serve as a certifying agency for companies and local governments to quantify and register their greenhouse gas emissions for possible future trading systems.

Assembly Bill 32 Nuñez & Pavley, 2006. Also known as The Global Warming Solutions Act of 2006, institutes a mandatory limit on greenhouse gas pollution and requires a reduction in emissions in California to 1990 levels by the year 2020. The bill also directs the California Air Resources Board (CARB) to establish a mandatory reporting system to track and monitor emission levels and requires CARB to develop various compliance options and enforcement mechanisms.

Senate Bill 375 Steinberg, 2008. Assigns a greenhouse gas reduction target for car and light truck emissions for each region in the State represented by a metropolitan planning organization (MPO) that is to be addressed with a Sustainable Communities Strategy (SCS). Also touches on planning for transportation, housing and the environment and requires Alternative Planning Strategy documents where a SCS will not achieve the GHG reduction targets.

The most significant of these initiatives are AB 32 and SB 375; the first requires California to reduce its GHG to 1990 levels by 2020, and the second begins to tie GHG reductions to land use. In 2007, the California Air Resources Board (CARB) conducted an emissions inventory for the state to identify emissions levels in 1990 that figure 427 million metric tons of carbon dioxide equivalent. The inventory revealed that transportation was the largest single sector (35% of the state's total 1990 emissions), followed by industrial emissions (24%), imported electricity (14%), in-state electricity generation (11%), residential use (7%), agriculture (5%), and commercial use (3%).[6]

Preliminary estimates indicate that California's 2020 emission projections could be 600 million tons of CO_2e if no actions are taken to reduce GHG. This means that California must prevent 173 million tons of CO_2e from being emitted by 2020 in order to meet the 1990 levels as required by AB 32.

CARB is responsible for monitoring and reducing GHG emissions set forth in AB 32, and is, therefore, coordinating statewide efforts. In December 2008, CARB adopted a Scoping Plan that outlines the actions required for California to reach its 2020 emission target. The actions include a broad set of clean energy, clean transportation, and efficiency standards.

6 http://www.arb.ca.gov/newsrel/nr120607.htm, accessed 1/1/10.

In 2009, CARB identified and implemented nine discrete early action measures including regulations affecting landfills, motor vehicle fuels, refrigerants in cars, tire pressure, port operations and consumer products. Additional reduction measures to meet the 2020 target will be adopted in 2011.

Key strategies identified in the Scoping Plan that are best developed and supported by local governments in achieving the climate protection and emission reduction goals include:

- Transportation and community design
- Local and regional emission targets
- Recycling and waste reduction
- Clean energy
- Green buildings
- Water

The CARB Climate Change Scoping Plan "encourages local governments to adopt a reduction goal for municipal operations emissions and move toward establishing similar goals for community emissions that parallel the State commitment to reduce greenhouse gas emissions by approximately 15 percent from current levels by 2020."[7] However, CARB does not yet require cities to adopt climate action plans as part of AB32 implementation efforts.

Marin County Climate Policy

Underpinning sustainability and climate change efforts in Marin County is the recognition that Marin residents consume resources at a far greater rate than most industrialized nations, and that the worldwide use of resources is exceeding the earth's capacity to renew them. One way to measure the use of natural resources against the planet's actual biocapacity and ability to renew those resources is the "ecological footprint." It can be calculated for individuals, regions, countries, or the entire earth and is expressed as the number of global acres (acres with world average biological productivity) that it takes to support one person. As Figure 3 shows, the average American uses 24 global acres per capita, while the average Marin resident requires 27 global acres. Other western democracies, such as France, Germany, and Italy, have footprints of 13, 12, and 9.5 global acres per person, respectively. According to the Global Footprint network, if every person lived the lifestyle of one American, we would need five planets to sustain us.

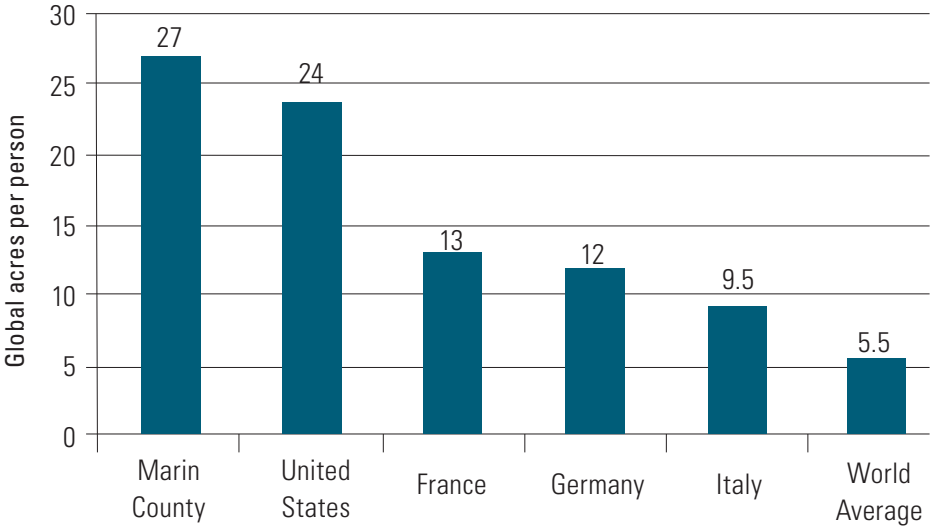


Figure 4: Ecological Footprint Comparison

Source: Redefining Progress, Sustainable Sonoma County, Worldwide Fund for Nature, as quoted in the Marin Countywide Plan, adopted November 6, 2007.

7 California Air Resources Board, "Climate Change Scoping Plan," December 2008, p. 27, http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf, accessed 3/31/10.

In 2006, Marin County developed a strategic plan to reduce annual GHG emissions to 15% below 1990 levels by 2020. In 2007, the County re-inventoried their greenhouse gas emissions. Figures 4 and 5 show the distribution of County-wide GHG emissions by sector in 2005 and emission trends between 1990 and 2005. Total countywide greenhouse gas emissions increased by approximately 6% between 1990 and 2005, from 3,005,674 to 3,188,522 tons CO_2e.[8] This 6% rate of increase can be used as a proxy to estimate the increase in Tiburon's emissions between 1990 and 2005, since actual data is unavailable.

While the County has taken important steps to reduce greenhouse gas emissions, a large portion of Marin County is operated and governed by the eleven local jurisdictions and numerous special districts. It is therefore important that the municipalities, such as Tiburon, participate in developing local emission reduction measures and policies.

Figure 5: Marin County Emissions by Sector (2005)

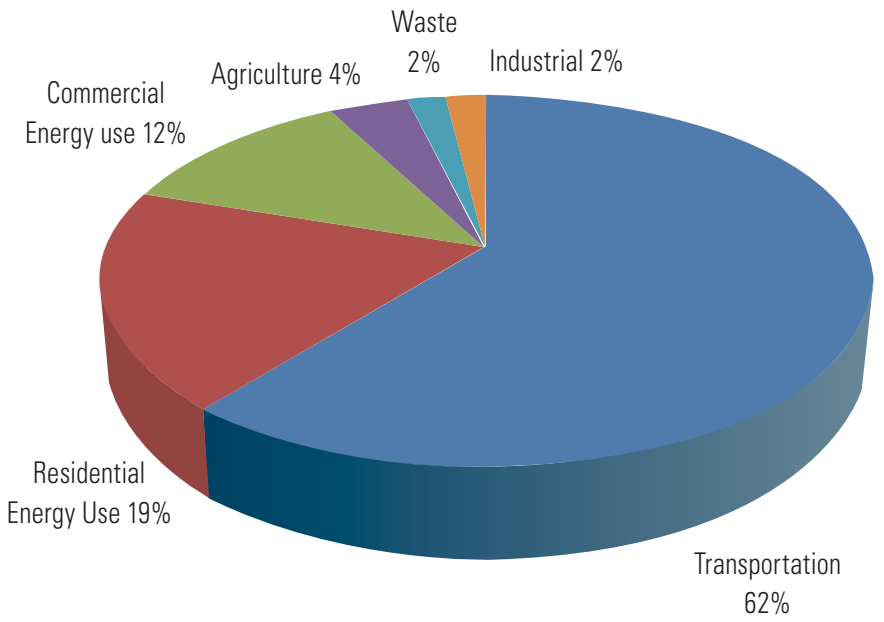
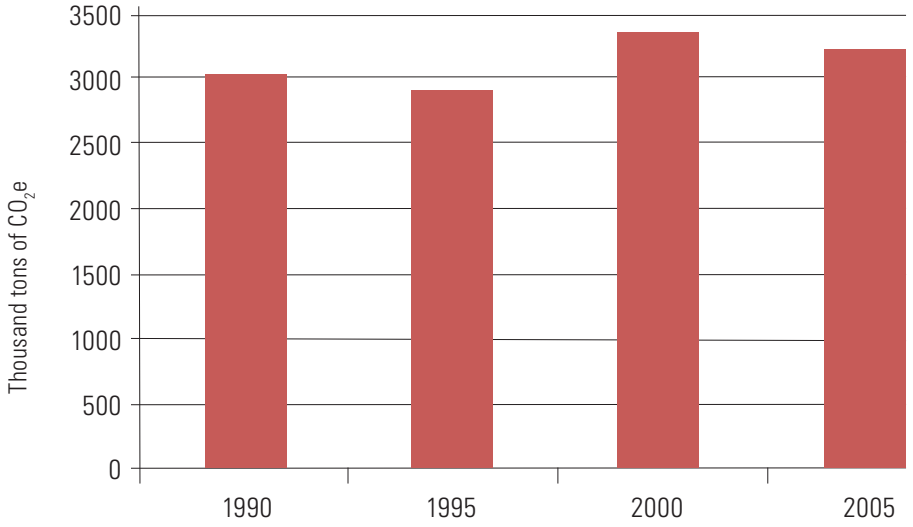


Figure 6: Marin County Emissions 1990-2005



8 "Marin County Re-Inventory of Greenhouse Gas Emissions," Marin County Community Development Agency, September 2007.

Coordinated Multi-Jurisdictional Approach: Marin Climate and Energy Partnership

Created in 2007, the mission of the Marin Climate & Energy Partnership (MCEP) is to reduce greenhouse gas emission levels to the targets of Marin County and local municipalities, consistent with the standards set by AB32. All eleven Marin cities and towns, the Marin County Community Development Agency, the Transportation Authority of Marin, and the Marin Municipal Water District are members. The Marin General Services Authority is the joint powers authority with fiscal responsibility for the Partnership.

One of MCEP's first projects was to work with ICLEI – Local Governments for Sustainability, a nonprofit organization, to develop greenhouse gas emissions inventories for the partner jurisdictions. With Bay Area Air Quality Management District grant funding, MCEP also worked on programs related to reducing energy use in municipal buildings, establishing a green purchasing collaborative, reducing energy use in residential and commercial buildings, reducing emissions from private and municipal vehicles, and reducing energy use and emissions from waste.

In 2009, MCEP developed a green building strategic plan and green building policies which resulted in the Marin Green BERST model ordinance. The Marin Community Foundation provided funding for this effort, as well as funds to develop climate action plans for six partner jurisdictions. Partner members have agreed to use their adopted climate action plans to identify mutual measures to reduce community-wide greenhouse gas emissions and develop policies and programs to support priority measures. The Town has worked closely with the Marin Climate and Energy Partnership to complete this climate action plan, and to implement a coordinated approach to local and regional emissions reduction targets and climate action planning goals.

2. TIBURON'S GREENHOUSE GAS EMISSIONS

2.1 Tiburon's Profile

Located on a peninsula in Marin County approximately seven miles north of the Golden Gate Bridge, Tiburon is a small town with a land area of 4.5 square miles and an estimated current population of 8,962.[9] Primarily a residential community of single-family homes, Tiburon has a relatively small percentage of land devoted to multi-family development and commercial uses. There are two commercial areas that provide necessary goods and services for residents, as well as public and private schools for grades K-8, a post office, a library, police and fire stations, and a Town Hall. With abundant parks and open space, and both public and private recreational facilities, there are many recreational opportunities within town. Although some residents work in Tiburon, a majority commute to jobs in San Francisco, elsewhere in Marin County, and other locations outside Marin County.

Tiburon Boulevard, a state highway maintained by Caltrans, runs along the length of the peninsula and connects to Highway 101. As the principal roadway on a peninsula, most vehicle trips in Tiburon require some segment to be driven on this roadway. Walking or biking are viable ways to get around the flatter areas of town, especially in the neighborhoods located close to schools and commercial areas. There is one Class 1 multi-use path that runs along the Richardson Bay shoreline to the downtown area, where it becomes a striped bicycle lane for a short segment. Public transit is limited within Tiburon, with two bus routes serving Tiburon Boulevard primarily during morning and evening commute periods. Ferry service is located in the downtown and provides a convenient way for residents to commute to San Francisco.

9 2010 U.S. Census, Table P1

2.2 2005 Greenhouse Gas Emissions Inventory

The first step toward reducing greenhouse gas emissions is to identify sources of emissions and establish baseline levels. This information can then inform the selection of a reduction target and possible reduction measures to be included in the climate action plan. In 2009, the Town prepared a report that inventories greenhouse gas emissions from the Tiburon community and, as a subset of that analysis, local government operations. The report provides a detailed understanding of where the highest emissions are coming from, and, therefore, where the greatest opportunities for emissions reductions lie. The inventory also establishes a baseline emission inventory against which to measure future progress.

The inventory analyzes four primary sectors of community emissions: residential, commercial, transportation, and waste. Residential and commercial emissions come primarily from the on-site combustion of natural gas and the off-site generation of electricity for heating, cooling, lighting, cooking, and the operation of appliances and electrical devices. Transportation emissions result from the combustion of diesel and gasoline on roadways within the Town of Tiburon. Waste emissions come from the decomposition of waste generated by residents and businesses in landfills outside the Town limits.

Government operations emissions are categorized according to six primary sectors: buildings; streetlights and park lighting; water delivery facilities such as irrigation systems; vehicle fleet, including police and public works vehicles; government-generated solid waste, including public trash cans and street sweepings; and employee commute.

The inventory utilizes 2005 as the baseline year, as this year is increasingly becoming the standard for such inventories. Due to lack of city-specific data, the 1990 baseline year utilized by the State of California is usually too difficult for most local governments to meet and would not produce the most accurate inventory. According to the Association of Bay Area Governments (ABAG) Projections 2009, Tiburon's population was 8,800 in 2005, and there were approximately 3,760 households. Included as an indicator of commercial activity, the number of jobs within Tiburon in 2005 was 3,180.

Community Inventory Results

In 2005, the Tiburon community emitted approximately 53,143 metric tons of CO_2e. As shown in Figure 6 below, the Transportation sector was the largest source of emissions, generating approximately 23,453 metric tons of CO_2e, or 44.1% of total 2005 emissions. Transportation emissions are the result of diesel and gasoline combustion in vehicles traveling on local roads and Tiburon Boulevard. Electricity and natural gas use in the Residential sector emitted 22,515 metric tons CO_2e, representing 42.4% of total emissions. The Commercial/Industrial sector, the third greatest source of 2005 emissions, generated 5,036 metric tons CO_2e, or 9.5% of the total. The remaining 4% (2,138 metric tons) are the estimated future methane emissions that will result from the decomposition of waste that was generated by the Tiburon community during 2005.

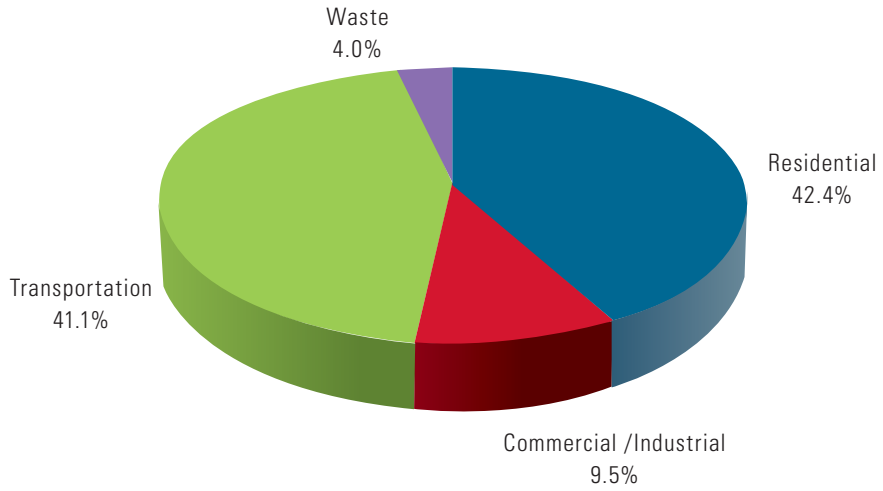


Figure 7: 2005 Community CO_2e Emissions

Government Operations Inventory Results

In 2005, Tiburon government operations emitted approximately 389 metric tons of CO_2e. As shown in Table 1, the Vehicle Fleet sector was the largest emitter (33%) in 2005. Emissions from the Employee Commute sector produced the second highest quantity of emissions, resulting in 28.3% of total CO_2e; and the Buildings sector produced 21% of total emissions. The remainder of emissions came from the Waste sector (9.9%) and the Lighting sector (7.8%), with nominal emissions from the Water sector. Emissions from government operations produced approximately 0.7% of total community emissions.

Table 1: 2005 Government Operations Emissions by Sector

Sector	Greenhouse Gas Emissions (metric tons CO_2e)	Greenhouse Gas Emissions (% CO_2e)	Energy Equivalent (million Btu)	Cost* ($)	% of Total Cost
Buildings	82	21.0%	1,254	$42,032	45.4%
Vehicle Fleet	128	33.0%	1,766	$35,589	38.5%
Lighting	31	7.8%	445	$14,487	15.7%
Water	0.04	0.0%	1	$379	0.4%
Waste	38	9.9%	0	n/a	0.0%
Employee Commute	110	28.3%	1,418	n/a	0.0%
TOTAL	389	100.0%	4,883	$92,486	100.0%

* Energy cost for electricity, natural gas, gasoline and diesel in 2005.

10 This number includes all Scope 1 emissions from the on-site combustion of fuels in facilities and vehicles, Scope 2 emissions from the purchase of electricity, and Scope 3 emissions from waste generated by local government operations and emissions associated with employee commute patterns.

2.3 Forecast for 2020 Emissions

To illustrate the potential emissions growth based on projected trends in energy use, driving habits, job growth, and population growth from the baseline year going forward, this plan includes an emissions forecast for the year 2020. Under a business-as-usual scenario, Tiburon's emissions will grow by approximately 9.3% by the year 2020, from 53,142 to 58,095 metric tons CO_2e. Table 2 shows the result of the forecast by sector. A variety of different reports and projections were used to create the emissions forecast, as profiled below.

For the residential and waste sectors, population projections for Tiburon, as released by the Association of Bay Area Governments (ABAG) in 2009, were used to estimate average annual compound growth in energy demand. ABAG estimates the Tiburon population will increase from 8,800 in 2005 to 9,200 in 2020. This increase of 400 persons is projected to result in an annual growth in residential and waste emissions of 0.3%.

Analysis contained within *California Energy Demand 2008-2018: Staff Revised Forecast*[11], a report by the California Energy Commission (CEC), shows that commercial floor space and the number of jobs have closely tracked the growth in energy use in the Commercial Sector. ABAG projects job growth will increase from 3,180 jobs in 2005 to 3,770 in 2020. Using this growth projection of 590 jobs, it was calculated that the average annual growth in energy use in the commercial sector between 2005 and 2020 would be 1.14%.

For the transportation sector, the Metropolitan Transportation Commission (MTC) projects that county-wide vehicle miles traveled in Marin County will increase at a rate of 0.78% a year between 2006 and 2020, or approximately 12.4% between 2005 and 2020.[12]

As no significant expansion of government services is expected over the next ten years, government operations emissions are projected to remain consistent with 2005 levels under a business as usual scenario.

Table 2: Forecast for 2020 Emissions

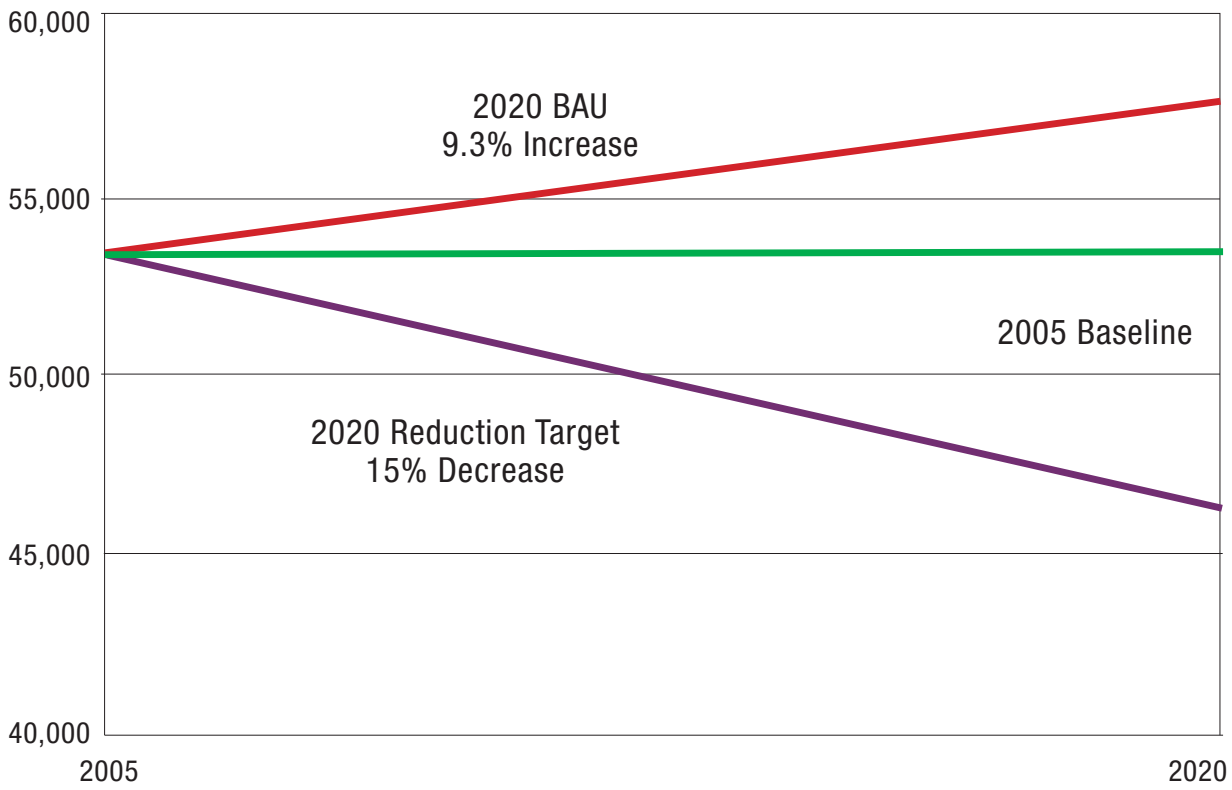
Sector	2005 (metric tons CO_2e)	2020 (metric tons CO_2e)	Annual Growth Rate	Percent Change from 2005 to 2020
Residential	22,515	23,538	0.30%	4.5%
Commercial	5,036	5,970	1.14%	18.6%
Transportation	23,453	26,351	0.78%	12.4%
Waste	2,138	2,235	0.30%	4.5%
TOTAL	53,142	58,095	0.60%	9.3%

11 http://www.energy.ca.gov/2007publications/CEC-200-2007-015/CEC-200-2007-015-SF2.PDF
12 Transportation 2035 Plan for the San Francisco Bay Area - Travel Forecasts Data Summary

2.4 Greenhouse Gas Emissions Reduction Target

This Climate Action Plan proposes an emissions reduction target of 15% below 2005 levels by 2020, which is consistent with the State's direction to local governments in the AB 32 Scoping Plan.[13] A target of 15% below 2005 emissions levels would limit community emissions to 45,170 metric tons in 2020. Figure 7 provides a comparison of the business-as-usual forecast for 2020 to the 2005 baseline year and the 15% reduction target. Figure 7 is also a depiction of Tiburon's challenge in attempting to meet its reduction targets. Emissions will continue to increase along the business-as-usual scenario while reduction efforts are initiated. Achieving the target is therefore more than a 15% decrease – rather, it is a 22.2% reduction from projected 2020 emissions levels for the Tiburon community.

Figure 8: Emissions Reduction Target



13 California Air Resources Board, "Climate Change Scoping Plan," December 2008, p. 27, http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf, accessed 3/31/10.

3. ACTIONS TO REDUCE GREENHOUSE GAS EMISSIONS

3.1 Summary of Greenhouse Gas Reduction Strategies

The mitigation measures presented in this chapter, as summarized in the tables below, achieve greenhouse gas emissions reductions in the community of 12,501 metric tons CO_2e or approximately 24% below the 2005 baseline. When state reductions are added, emissions in Tiburon would be approximately 32% below 2005 levels -- enough to allow the Town to surpass a reduction target of 15% below the 2005 baseline by 2020.

Within government operations, the Town could achieve reductions of 137 metric tons CO_2e, or approximately 35% below 2005 levels by implementing all of the specific, measurable actions listed in the following sections. A wide range of programs that exceed the Town's reduction goal have been included to allow for the consideration and prioritization of each program, based on its estimated cost, annual savings, and GHG reduction benefit, during the consideration of new programs, development projects, and funding opportunities. State actions would reduce emissions by another 7%, and programs to offset emissions could reduce emissions by an additional 27%.

Table 3: Mitigation Measures for Community Emissions

Section		GHG Reductions (Metric Tons)
3.2	Land Use and Transportation	1,284
3.3	Green Building, Energy Efficiency and Renewable Energy	9,669
3.4	Waste Reduction, Recycling and Zero Waste	869
3.5	Water and Wastewater	679
	SUBTOTAL	12,501
	% below 2005 levels	23.5%
3.6	State Actions	4,270
	% below 2005 levels	8.0%
TOTAL		16,771
Cumulative % below 2005 levels		31.6%

Table 4: Mitigation Measures for Government Operations Emissions

Section		GHG Reductions (Metric Tons)
3.2	Land Use and Transportation	32.2
3.3	Green Building, Energy Efficiency and Renewable Energy	95.5
3.4	Waste Reduction, Recycling and Zero Waste	9.6
	SUBTOTAL	137.3
	% below 2005 levels	35.3%
3.6	State Actions	28.7
	% below 2005 levels	7.4%
3.2, 3.3	Carbon Offsets	104.8
	% below 2005 levels	26.9%
TOTAL		271
Cumulative % below 2005 levels		69.6%

3.2 Land Use and Transportation

Transportation and land use development are strongly interrelated. The more suburban the development (i.e., low density housing which causes residents to live further from urban centers), the less viable are mass transit systems and other alternative modes of transportation such as walking or biking, and the more dependent residents become on the automobile. Studies have shown that people who live near transit drive between 10 and 30% less and that low-density suburban development generates twice as much GHG emissions per capita than a more dense urban development pattern. As a result, the transportation sector is one of the largest sources of GHG emissions. Though Marin County is known for its environmental consciousness, it is also known for its low-density developments, larger homes, multi-vehicle households, and consumerism. It also ranks among the highest in the U.S. in terms of per capita GHG emissions.

Schools in Marin County also generate a high number of vehicle trips. According to the Transportation Authority of Marin, 21% of all AM peak hour trips are home-to-school trips. The most recent Safe Routes to School surveys show that 9% of Reed School students, 15% of Bel Aire students, and 23% of Del Mar students walk or bike to school. More students could be encouraged to walk or bike to school through safety enhancements and an expanded bike and pedestrian network.

Table 5: Section 3.2 Community Mitigation Measures

Mitigation Measures for Community		
Measure		GHG Reductions (Metric Tons)
3.2.C1	Encourage Workforce Housing and Transit-oriented Development	13
3.2.C2	Increase Walking and Biking for Local Trips	524
3.2.C3	Increase Public Transit Use	535
3.2.C4	Increase Ridesharing	63
3.2.C5	Accelerate Adoption of Electric Vehicles	149
	TOTAL	1,284
	% Reduced from 2005 Levels	2.4%

Table 6: Section 3.2 Government Operations Mitigation Measures

Mitigation Measures for Government Operations				
Measure		Cost to Implement	Annual Savings	GHG Reductions (Metric Tons)
3.2.G1	Replace Town Vehicles with Hybrid or Electric Vehicles	As replaced	$2,200	6.0
3.2.G2	Encourage Town Employees to Commute by Alternative Means of Transportation	Variable	n/a	11.0
3.2.G3	Replace Police Patrol Cars with More Fuel-Efficient Vehicles	As replaced	$6,000	15.2
3.2.G4	Offset Emissions from Town Vehicles	$1,200/year	n/a	92.1
	TOTAL			124.3
	% Reduced from 2005 Levels			32.0%

The Town will consider the following list of recommended actions:

1. Reduce GHG emissions through the General Plan and project review processes.
   a. Promote compact and efficient development, such as orienting new development to capitalize on access to public transportation and local services and shopping.
   b. Encourage a "balanced" community, where residents do not have to travel long distances for service needs.
   c. Promote the development of workforce housing for local employees and second units for in-home providers of childcare, healthcare, building and grounds maintenance, and others.
   d. Make reductions in vehicle miles traveled (VMT) and the use of alternative transportation high-priority criteria in the evaluation of policy, program and project alternatives.

2. Encourage bicycling and walking as a safe and efficient means to travel around Tiburon.
   a. Provide and maintain Class I, II and III bikeways as identified in the Tiburon Bicycle and Pedestrian Plan.
   b. Improve bicycle and pedestrian safety at intersections and install bicycle loop detectors at signalized intersections to help cyclists trip the traffic signal.
   c. Implement "Complete Streets" policies to ensure the needs of bicyclists, pedestrians and the disabled are considered in the transportation element of any new capital improvement or development project.
   d. Install walkways where feasible to provide a continuous pedestrian network.
   e. Provide bicycle racks at public destinations as identified in the Tiburon Bicycle and Pedestrian Plan.
   f. Provide bicycle parking at large public events.
   g. Encourage employers to provide secure, covered bicycle parking and shower and changing facilities for employees.
   h. Promote "Share the Road" strategies to improve bicycle safety and improve compliance with traffic laws.

i. Participate in programs that encourage bicycling and walking, such as Safe Routes to School programs.

3. Support and promote public transit.
   a. Work with neighboring cities, regional transit providers and the Transportation Authority of Marin to increase both the frequency and types of transit services available to Tiburon residents, employees and visitors.

4. Support and promote ridesharing and car sharing programs.
   a. Encourage the creation of a system to facilitate informal carpools for Tiburon commuters.
   b. Promote ridesharing programs, such as SchoolPool Marin and 511 Rideshare.
   c. Work with the County to develop a community car sharing program, when determined to be feasible.

5. Educate residents and employees about the health and environmental benefits of walking, cycling, taking public transit and ridesharing, and provide information to assist in these modes of travel (e.g., information available in public places and employment centers regarding bus schedules, pedestrian pathways, bikeways and ridesharing programs).

6. Encourage the use of fuel-efficient and low GHG-emitting vehicles and driver behaviors.
   a. Encourage private development to provide prioritized parking for hybrid, electric and carpool vehicles.
   b. Adopt and implement a policy requiring limitations on idling for commercial vehicles, construction vehicles, buses and other similar vehicles beyond state law, where feasible.

7. Purchase or lease low or zero-emissions vehicles and the most fuel efficient models possible for the Town fleet where appropriate.

8. Provide Town employees with incentives to use alternatives to single occupant auto commuting, such as transit incentives, bicycle facilities, ridesharing services and subsidies.

9. Increase ownership of plug-in electric vehicles (EV) by providing EV charging station infrastructure, where appropriate, and encouraging property owners and developers to install EV charging stations in commercial and residential projects.

10. Achieve further carbon reductions for Town fleet operations by purchasing carbon offsets through a program such as TerraPass, after maximizing GHG reductions through alternative transportation measures.

3.3 Green Building, Energy Efficiency And Renewable Energy

The two fundamental means for reducing emissions from electricity and natural gas use are decreasing consumption through efficiency and switching from fossil fuels to renewable sources. According to the U.S. Department of Energy, buildings account for approximately 39% of total energy use, over 12% of the total water consumption, 68% of total electricity consumption, and 38% of all carbon dioxide emissions annually in the United States.

Increasing the efficiency of buildings is the most cost-effective approach for reducing greenhouse gas emissions. Programs which require minimum energy efficiency upgrade for home remodeling, such as increasing insulation and sealing heating ducts, have demonstrated energy savings of up to 20%.

New construction techniques and building materials, known collectively as "green building," can significantly reduce the use of resources and energy and creation of waste in our homes and commercial buildings. Green construction methods can be integrated into buildings at any stage, from design and construction to renovation and deconstruction.

As an amendment to the new CalGreen standards, Tiburon requires residential additions of over 500 square feet and non-residential building additions of over 3,000 square feet, to meet certain green building requirements that are more restrictive than CalGreen. In addition, the Town requires new single-family houses with over 3,500 square feet of conditioned space to use no more energy than allowed for a 3,500 square foot home.

Table 7: Section 3.3 Community Mitigation Measures

Mitigation Measures for Community		
Measure		GHG Reductions (Metric Tons)
3.3.C1	Improve Energy Efficiency in 20% of Existing Residential Buildings	901
3.3.C2	Improve Energy Efficiency in 20% of Existing Commercial Buildings	201
3.3.C3	Reduce Energy Use in New Residential Construction	82
3.3.C4	Reduce Energy Use in New Commercial Construction	119
3.3.C5	Install Solar Energy Systems in 20% of Existing Residential Buildings	1,273
3.3.C6	Install Solar Energy Systems in 15% of Existing Commercial Buildings	395
3.3.C7	10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity	815
3.3.C8	70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity	5,133
3.3.C9	Offset Emissions for 5% of Natural Gas Use	751
	TOTAL	9,669
	% Reduced from 2005 Levels	18.2%

Table 8: Section 3.3 Government Operations Mitigation Measures

Mitigation Measures for Government Operations				
Measure		Cost to Implement	Annual Savings	GHG Reductions (Metric Tons)
3.3.G1	Install Energy Efficiency Upgrades in Town Buildings	$51,200	$4,200	8.2
3.3.G2	Install Solar Energy System on Town Hall	Completed	$6,900	9.0
3.3.G3	Install Solar Energy System on Police Station	$96,500	$3,200	4.1
3.3.G4	Upgrade Street Lighting to Energy-efficient Technologies (LED)	$146,200	$6,600	12.2
3.3.G5	Purchase Energy-efficient Appliances	$1,950	$200	0.3
3.3.G6	Purchase Marin Clean Energy Deep Green Electricity for Government Facilities	$2,800	n/a	61.7
3.3.G7	Offset Emissions from Natural Gas Use	$150/year	n/a	12.6
	TOTAL			108.2
	% Reduced from 2005 Levels			27.8%

The Town will consider the following list of recommended actions:

1. Adopt energy efficiency requirements for residential projects under 3,500 square feet.

2. Consider adopting standards similar to the Marin Green BERST model green building ordinance.

3. Provide incentives to development projects that exceed adopted green building standards.

4. Develop a town-wide green building promotional campaign. Educate Town staff and policy makers about best practices; provide checklists and specification guidelines for contractors; post green building information on the Town's website.

5. Require energy efficiency audits for residences and businesses during major remodeling projects.

6. Consider methods to inform property owners of recommended energy upgrades at time of property sale, such as weather stripping doors and windows and stopping air leaks.

7. Support efforts of PG&E and the Marin Energy Authority to maximize residential and business subscription rates for energy efficiency programs and to promote conservation and renewable energy use.

8. Support efforts of Marin Clean Energy to increase the renewable content of the electricity provided to Tiburon residents and businesses.

9. If available, participate in a countywide or regional property assessment district financing program to assist homeowners in funding installation of energy efficiency upgrades and renewable energy systems.

10. Adopt policies and incentives to encourage residents and businesses to install solar and renewable energy systems, including solar panels to generate electricity and solar water heating systems, and to construct solar ready buildings.

11. Complete energy efficiency upgrades to Town facilities as recommended by the Marin Energy Management Team.

12. Replace street lights and parking lot lights with energy-efficient technologies, such as LED lighting.

13. Install additional photovoltaic panels at Town facilities, if feasible.

14. Design new and remodeled public facilities to meet LEED Silver requirements, or its equivalent, and, at a minimum, to not require any additional energy use over existing facilities.

15. Prioritize purchases of products and services with superior environmental performance and purchase energy-efficient office equipment and appliances.

16. Implement operational policies to reduce energy use and conserve resources, such as setting the printer's default option to duplex printing and shutting off computers and imaging equipment at night whenever feasible.

17. Consider purchasing Marin Clean Energy Deep Green 100% renewable electricity for all Town operations.

18. Achieve further carbon reductions by purchasing carbon offsets or participating in programs such as ClimateSmart, after maximizing GHG reductions through conservation, energy efficiency and renewable energy measures.

3.4 Waste Reduction, Recycling and Zero Waste

The reduction of waste, as well as the reuse and recycling of products, is key to reducing impacts on the environment. It is necessary to rethink what has traditionally been regarded as garbage and treat all materials as valued resources instead of items to discard. This requires shifting consumption patterns, more carefully managing purchases, and maximizing the reuse of materials at the end of their useful life.

The Town of Tiburon is a member of the Marin Hazardous and Solid Waste Joint Powers Authority (JPA), which works with private waste haulers and facility operators to implement recycling programs and achieve state-mandated targets for waste diversion rates. Marin County has a high rate of diversion, with a current rate of about 72%.

In 2009, the JPA completed a zero-waste feasibility study which concluded that between 75% and 80% of the material that goes to the landfill can be diverted. Currently the JPA is targeting the diversion of food waste and demolished building materials to increase the county's diversion rate.

The JPA has embraced an aggressive goal for achieving zero waste based upon realizing 80% diversion of waste from disposal by 2012 and achieving zero waste by 2025.

The JPA supports the collection and processing of green waste and food waste to create electricity from methane gas. The waste is processed in anaerobic digesters for soil amendments and the production of biogas. Biogas is the gas produced by anaerobic digestion of organic matter and consists of 60-80% methane (natural gas), 30-40% carbon dioxide, and other trace gases such as hydrogen sulfide, ammonia and hydrogen. The predominance of methane means it can be used as a fuel source.

The JPA proposes that the member agencies endorse an Extended Producer Responsibility resolution and sign the California Product Stewardship Council pledge to shift California's product waste management system from one focused on government funded and ratepayer financed waste diversion to one that relies on extended producer responsibility (EPR) in order to reduce public costs and drive improvements in product design that promote environmental sustainability.

Table 9: Section 3.4 Community Mitigation Measures

Mitigation Measures for Community		
Measure		GHG Reductions (Metric Tons)
3.4.C1	Divert All Food Waste from Landfill	413
3.4.C2	Reduce All Other Solid Waste Disposal to Landfills by 25%	456
	TOTAL	869
	% Reduced from 2005 Levels	1.6%

Table 10: Section 3.4 Government Operations Mitigation Measures

Mitigation Measures for Government Operations				
Measure		Cost to Implement	Annual Savings	GHG Reductions (Metric Tons)
3.4.G1	Reduce Solid Waste Disposal to Landfill by 25%	n/a	n/a	9.6
	% Reduced from 2005 Levels			2.5%

The Town will consider the following list of recommended actions:

1. Adopt a policy to achieve zero waste going to landfills.

2. Endorse an Extended Producer Responsibility resolution as proposed by the JPA.

3. Provide education and publicity about reducing waste and available recycling services.

4. Adopt local amendments to the 2010 California Green Building Standards Code to require 50% construction and demolition waste diversion for construction, demolition and renovation projects, as proposed in the JPA's model ordinance.

5. Adopt and enforce a multi-family dwelling and business recycling ordinance.

6. Review and revise the Town's franchise agreement with its waste hauler to ensure waste reduction and diversion rates are maximized.

7. Promote commercial and residential composting.
   a. Partner with Master Gardeners, Marin Food Scrap Recycling Task Force, and others to provide education and resources to residents on backyard and curbside composting.
   b. Work with Mill Valley Refuse Service and Redwood Landfill to promote commercial and residential food waste collection in Tiburon and to create centrally located facilities to compost all green and food waste and process it into biogas.

8. Strengthen recycling programs, purchasing policies, and employee education at Town facilities.

3.5 Water and Wastewater

Water demand in California is increasing because of population expansion. In addition, demand for water for irrigation rises with warmer temperatures. The actual impacts of the climate-induced change in water quality, quantity and demand will depend on the changes in water policy and operations, and on the water use patterns of all communities.

The Marin Municipal Water District (MMWD) supplies clean drinking water to a 147 square-mile area of south and central Marin. MMWD's water comes from three main sources: local reservoirs, the Russian River in Sonoma County and recycled water.

Tiburon falls within MMWD's jurisdiction and all properties in Tiburon are subject to the agency's water conservation regulations. The water conservation requirements, particularly irrigation efficiency, are fairly complex, and the Town relies on MMWD to provide technical review and oversight on water conservation and direction in regard to drought-tolerant landscaping. In December 2010, MMWD updated their regulations to comply with CALGreen, the State's new Green Building code. The new CALGreen code requires every new building to reduce indoor and outdoor water use by 20%. MMWD has also adopted water-efficient landscaping requirements that apply to all newly constructed and rehabilitated developer-installed residential landscapes of 1,000 square feet or greater, as well as homeowner residential projects of 2,500 square feet or greater.

In 2007, MMWD adopted a Water Conservation Plan intended to reduce water usage by approximately 9% by 2020. At the end of fiscal year 2009-2010, water usage had fallen 8.7% below 2005 levels. Additional water conservation measures could further reduce greenhouse gas emissions in Tiburon. The most effective way to reduce emissions from water use is by reducing hot water use, as an estimated 35% of energy used in homes is for water heating.

Table 11: Section 3.5 Community Mitigation Measure

Mitigation Measures for Government Operations		
Measure		GHG Reductions (Metric Tons)
3.5.C1	Reduce Hot Water Use in Community by 15%	679
	% Reduced from 2005 Levels	1.3%

The Town will consider the following list of recommended actions:

1. Assess, maintain and repair existing plumbing fixtures, pipes, and irrigation systems in all Town buildings and facilities to minimize water use, including landscaping, public rest rooms and parks, and other recreational facilities. As feasible, upgrade and retrofit agency plumbing and irrigation systems with state-of-the-art water conserving technology.

2. Encourage the use of plants which are native to northern California and Marin County, and the use of drought-tolerant plant material.

3. Minimize turf areas and avoid narrow turf areas, such as in parking strips. Encourage homeowners to avoid turf and replace existing turf areas.

4. Consider water heater upgrade incentives.

5. Conduct water audits on remodels and new homes.

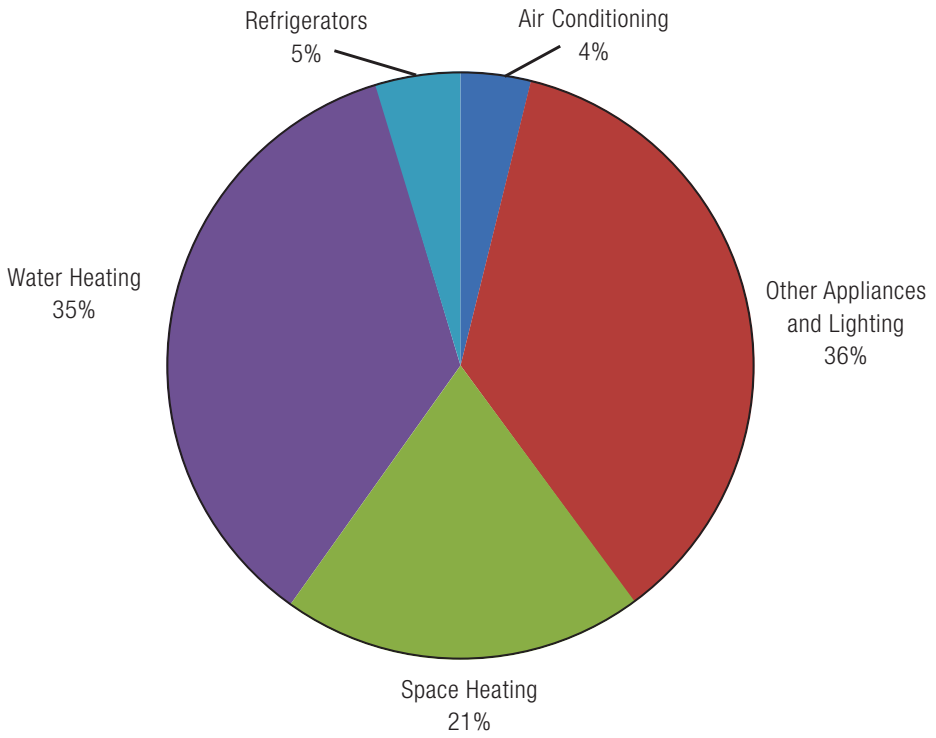
6. Adopt a retrofit program to encourage or require installation of water conservation measures in existing businesses and homes.

7. Provide education about water conservation and available programs and incentives.

8. Allow for the use of grey water for irrigation and other suitable uses to decrease the amount of potable water need by the community.

9. Work cooperatively with MMWD to enforce water conservation requirements and participate in water conservation outreach programs.

Figure 9: Energy Used in California Homes (2005)



3.6 State Actions

The following are state reduction strategies included in the AB 32 Scoping Plan and accounted for in the Town's adjustment of the business-as-usual forecast. To clarify, the State of California has approved, programmed, and/or adopted these actions. Furthermore, they are programs or projects that require no local involvement. Incorporating them into the forecast and reduction assessment provides a more accurate picture of future emissions growth and the responsibility for action.

Table 12: Section 3.6 Community Mitigation Measures

Measure		GHG Reductions (Metric Tons)
3.6.C1	PG&E Achieves 33% Renewable Portfolio Standard by 2020	778
3.6.C2	AB 1493 Pavley Standards	1,824
3.6.C3	Low Carbon Fuel Standard	1,668
	TOTAL	4,266
	% Reduced from 2005 Levels	8.0%

Table 13: Section 3.6 Government Operations Mitigation Measures

Measure		GHG Reductions (Metric Tons)
3.6.G1	AB 1493 Pavley Standards	15.0
3.6.G2	Low Carbon Fuel Standard	13.7
	TOTAL	28.7
	% Reduced from 2005 Levels	7.4%

Low Carbon Fuel Standard

The State is proposing to reduce the carbon intensity of transportation fuels consumed in California. To achieve this, CARB is developing a Low Carbon Fuel Standard (LCFS), which would reduce the carbon intensity of California's transportation fuels by at least 10% by 2020 and 20% by 2035 as called for by Governor Schwarzenegger in Executive Order S-01-07. LCFS will incorporate compliance mechanisms that provide flexibility to fuel providers in how they meet the requirements to reduce greenhouse gas emissions. CARB estimates the Low Carbon Fuel Standard will reduce California's projected 2020 transportation emissions by 6.7%.

Pavley (AB 1493)

Assembly Bill 1493 (Pavley), signed into law in 2002, will require carmakers to reduce greenhouse gas emissions from new passenger cars and light trucks beginning in 2011. The California Air Resources Board adopted regulations in September 2004 that create two phases of increasingly stringent standards for car manufacturers between 2009 and 2020. The first phase, which has already been adopted, is expected to reduce California's projected 2020 transportation emissions by 7%.

Renewable Portfolio Standard (RPS)

Established in 2002 in Senate Bill 1078, the RPS program requires electricity providers to increase the portion of energy that comes from renewable sources to 20% by 2010 and to 33% by 2020. CARB estimates the RPS will reduce California's emissions from electricity use by 15.3% in 2020.

3.6 Adaptation

As the climate changes, so must Tiburon. To effectively address the challenges that a changing climate will bring, the Town must not only reduce its greenhouse gas emissions, but be prepared to respond to the expected impacts of climate change. Many of the mitigation measures incorporated in this Climate Action Plan will help the community prepare for the effects of climate change. Reducing water use will ease competition for limited water supplies expected from higher temperatures and reduced snowmelt, while reducing electricity use will help ease demand for diminishing hydroelectric power. Other expected effects from climate change – such as a higher frequency of large damaging fires and pest and insect epidemics – must be anticipated through adequate public safety, emergency, and public health responses.

Coastal communities like Tiburon will be especially challenged by rising sea levels. Existing development in inundation areas will need to be adequately protected from flooding and erosion due to climate change. The most practical approach for minimizing the effects from the adverse effect of sea level rise and storm activities is to carefully consider new development within areas vulnerable to inundation and erosion.

The Town will consider the following list of recommended actions:

1. Incorporate the likelihood of climate change impacts into Town emergency planning and training.

2. Partner with neighboring municipalities and regional agencies to develop and implement regional adaptation programs.

3. Partner with neighboring municipalities and regional agencies to prepare for and mitigate coastal inundation and cliffside erosion as a result of sea level rise.

4. Coordinate development of private erosion and flood control measures with neighboring properties to avoid unintended off-site impacts.

5. Encourage Federal, State and local agencies to be pro-active and supportive of efforts to combat the expected rise in sea levels.

6. Coordinate internally and with water districts, wildlife agencies, flood control and fire districts, Marin County, and other relevant organizations. Address human health and safety risks and the adaptability of natural systems, including the following:
   a. Water resources including expanded rainwater harvesting, water storage and conservation techniques, water reuse, and water-use and/or irrigation efficiency.
   b. Biological resources including land acquisition, creation of marshlands/wetlands as a buffer against sea level rise and flooding, and protection of existing natural barriers.
   c. Public health including heat-related health plans, vector control, safe water, and improved sanitation.
   d. Environmental hazards including seawalls, storm surge barriers, and fire protection.

4. PLAN IMPLEMENTATION

Tiburon recognizes that responding to and preparing for climate change is a critical step toward a sustainable future. The Town's early actions to reduce its contribution to climate change reflect the Town's history and commitment to decrease the impacts of day-to-day activities on the natural environment while enhancing its vibrant quality of life. Mitigating climate change will require everyone – residents, businesses, government agencies and nonprofit organizations – to work together to implement this plan.

This plan provides a strategy to achieve emission reductions that will achieve the Town's target of 15% below 2005 emissions by the year 2020. A wide range of programs that exceed the Town's reduction goal have been included to allow for the evaluation and prioritization of potential programs and capital improvement projects as new program and funding opportunities arise. Successful implementation of the plan will require staff and the Town Council to identify and commit resources to climate change mitigation activities, and to monitor and report on progress towards meeting emissions reduction goals.

The Town will consider the following list of recommended actions:

1. Monitor and report on the Town's progress bi-annually.

2. Update the baseline greenhouse gas emissions inventory every five years.

3. Continue and expand public and private partnerships that support implementation of the Climate Action Plan, including membership in the Marin Climate and Energy Partnership.

4. Identify funding sources for recommended actions, and pursue local, regional, state and federal grants as appropriate.

5. Review and update the Climate Action Plan every five years.

6. Amend the Climate Action Plan as necessary to comply with state regulations.

APPENDIX A

Data Sources, Assumptions and Calculations

All 2005 greenhouse gas emissions data for community and government operations are from the Town of Tiburon 2005 Greenhouse Gas Emissions Inventory, with emission factors as follows:

Emission Source	GHG	Emission Factor	Emission Factor Source
PG&E Electricity	CO_2	0.489155 lbs/kWh	The certified CO2 emission factor for delivered electricity is publicly available at http://www.climateregistry.org/CarrotDocs/19/2005/2005_PUP_Report_V2_Rev1_PGE_rev2_Dec_1.xls
	CO_2e	0.492859 lbs/kWh	PG&E
Default Direct Access Electricity	CO_2	343.3 short tons/GWh	ICLEI/Tellus Institute (2005 Region 13 - Western Systems Coordinating Council/ CNV Average Grid Electricity Coefficients)
	CH_4	0.035 short tons/GWh	
	N_2O	0.027 short tons/GWh	
Natural Gas	CO_2	53.05 kg/MMBtu	PG&E/CCAR. Emission factors are derived from: California Energy Commission, Inventory of California Greenhouse Gas Emissions and Sinks: 1990-1999 (November 2002); and Energy Information Administration, Emissions of Greenhouse Gases in the United States 2000 (2001), Table B1, page 140.
	CH_4	0.0059 kg/MMBtu	CCAR. Emission factors are derived from: U.S. EPA, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2000" (2002), Table C-2, page C-2. EPA obtained original emission factors from the Intergovernmental Panel on Climate Change, Revised IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual (1996), Tables 1-15 through 1-19, pages 1.53-1.57.
	N_2O	0.001 kg/MMbtu	

Avoided emissions are calculated using 2005 emission factors for comparative purposes.

Population and household estimates and projections are from the Association of Bay Area Governments, "Projections and Priorities 2009: Building Momentum," August 2009.

3.2 Land Use and Transportation

Measure 3.2.C1: Encourage Workforce Housing and Transit-oriented Development

Number of new housing units projected, 2005-2020	60
Number of new housing units in workforce and TOD projected, 2005-2020	30
Vehicle miles traveled (VMT) on local roads, projected 2020	15,301,126 VMT
Number of households, projected 2020	3,820
Local VMT per household, projected 2020	4,006 VMT
20% reduction in local VMT for transit-oriented units	24,033VMT
Estimated reduction in GHG emissions	13 metric tons

Data Source Notes and Assumptions: Household projections from the Association of Bay Area Governments, "Projections and Priorities 2009: Building Momentum," August 2009. Number of new transit-oriented housing units provided by Town of Tiburon Planning Department. Local roads Vehicle Miles Traveled (VMT) 2005 Data: Harold Brazil, Air Quality Associate, Metropolitan Transportation Commission (MTC), as reported in the Town of Tiburon 2005 Greenhouse Gas Inventory. Projected VMT based on Travel Forecasts Data Summary: Transportation 2035 Plan for the San Francisco Bay, Metropolitan Transportation Commission, December 2008. Transportation greenhouse gas emissions are based on emission factors as reported in the Town of Tiburon 2005 Greenhouse Gas Inventory as follows:

Emission Factors: Provided by the BAAQMD, using EMFAC 2007

	CO_2 Rates (grams/mile)		CH4 Rates (grams/mile)		N2O Rates (grams/mile)		VMT Mix		CO_2 Rates- (grams/gallon)		Fuel Usage		Fuel Efficiency (miles/gallon)	
Area	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel
Marin County	476	1,426	0.065	0.03	0.07	0.05	95.50%	4.50%	8,628	9,957	89.20%	10.80%	18.1	7
BAAQMD Average	463	1,389	0.063	0.03	0.07	0.05	94.90%	5.10%	8,607	10,091	87.80%	12.20%	18.6	7.3

Measure 3.2.C2: Increase Walking and Biking for Local Trips

Average daily walking and bicycling for utilitarian purposes per adult in Marin	0.67 miles
Estimated annual walking and biking miles traveled in Tiburon, year 2005	2,152,040 miles
Increase walking and biking miles traveled by 50% by 2020	1,076,020 miles
Estimated reduction in GHG emissions (metric tons)	524 metric tons

Data Source Notes and Assumptions: Average daily walking and bicycling data: Federal Highway Administration, "Interim Report to the U.S. Congress on the Nonmotorized Transportation Pilot Program SAFETEA-LU Section 1807," November 2007. According to this survey data, 11.8% of utilitarian trips in 2007 were made by walking and 1.8% by bicycle, for a total mode share of 13.6%. Estimated annual walking and biking miles in Tiburon assumes same mileage for children, which were not surveyed due to privacy concerns.

Measure 3.2.C3: Increase Public Transit Use

Average daily transit miles per adult in Marin	1.37 miles
Estimated transit miles traveled in Tiburon, year 2005	4,400,440 miles
Increase transit miles traveled by 50% by 2020	1,100,110 miles
Estimated reduction in GHG emissions (metric tons)	535 metric tons

Data Source Notes and Assumptions: Average daily transit data: Federal Highway Administration, "Interim Report to the U.S. Congress on the Nonmotorized Transportation Pilot Program SAFETEA-LU Section 1807," November 2007. According to this survey data, 3.2% of trips in 2007 were made using public transit. Estimated transit miles traveled in Tiburon assumes same mileage for children, which were not surveyed due to privacy concerns.

Measure 3.2.C4: Increase Ridesharing

Projected vehicle miles traveled in Tiburon, year 2020	15,301,126 miles
Ridesharing as a percentage of vehicle miles traveled, year 2007	1.7%
Increase ridesharing miles traveled by 50% by 2020	130,060 miles
Estimated reduction in GHG emissions	63 metric tons

Data Source Notes and Assumptions: Rideshare data: Federal Highway Administration, "Interim Report to the U.S. Congress on the Nonmotorized Transportation Pilot Program SAFETEA-LU Section 1807," November 2007.

Measure 3.2.C5: Accelerate Adoption of Electric Vehicles

Projected transportation GHG emissions from local road VMT in 2020	8,293 metric tons
2% of emissions displaced by electric vehicles	166
Electric vehicle VMT, year 2020	306,023
Electric vehicle electricity use	76,506 kWh
Electric vehicle emissions from electricity use	17 metric tons
Estimated reduction in GHG emissions	149 metric tons

Data Source Notes and Assumptions: Assumes electric vehicle energy efficiency of 4 miles per kWh, a generally accepted estimate. The 2011 Nissan Leaf, for example, is advertised to have a range of up to 100 miles on full battery charge of 24 kWh, which equates to approximately 4 miles per kWh. This measure counts transportation emissions reductions Tiburon could achieve by increasing the percentage of EVs in the community fleet 2% over State projections. For a discussion of the electric vehicle market and forecasts, see "Plugged in 2," Deutsche Bank, November 3, 2009, http://www.fullermoney.com/content/2009-11-03/ElectricCarsPluggedIn2.pdf. This report projects U.S. market shares in 2020 of 12% for hybrid electric vehicles, 7% for plug-in hybrid electric vehicles, and 4% for electric vehicles.

Measure 3.2.G1: Replace Town Vehicles with Hybrid or Electric Vehicles

Vehicle	VMT	GHG Emissions	Replacement	New GHG Emissions	kWh Use for EV	Fuel Cost Savings	GHG Reduction
1999 Chevy Tahoe	5,043	3.03	2009 Ford Escape Hybrid	1.41		$625	1.61
2000 Ford Ranger	5,696	2.85	2009 Honda Civic Hybrid	1.22		$633	1.63
2002 Nissan Maxima	4,599	2.07	Electric Vehicle Proposed	0.26	1,150	$624	1.81
2001 Nissan Altima	2,600	1.10	Electric Vehicle Proposed	0.14	650	$331	0.96
TOTAL	17,938	9.05		3.04	1,800	$2,214	6.01

Data Source Notes and Assumptions: VMT data from Town of Tiburon 2005 Greenhouse Gas Emissions Inventory background data reports. Assumes electric vehicle energy efficiency of 4 miles per kWh. Fuel cost savings assume an average price per gallon for gasoline of $3.50 and a per kWh cost of $0.157.

Measure 3.2.G2: Town Employees Commute by Alternative Means of Transportation

Employee commute GHG, year 2005	110.0 metric tons
10% reduction	11 metric tons

Measure 3.2.G3: Replace Police Patrol Cars with More Fuel-Efficient Vehicles

Patrol car VMT, year 2005	164,486 VMT
Patrol car fuel (estimated), year 2005	7,477 gallons
Patrol car GHG emissions, year 2005	67 metric tons
Projected fuel reduction, year 2020	1,725 gallons
Projected fuel savings, year 2020	$6,039
Projected GHG emissions reduction, 2020	15.2 metric tons

Data Source Notes and Assumptions: Assumes fuel-efficient patrol cars will be available, such as vehicles currently in development by Carbon Motors. As advertised, these have an ultra low-sulfur, "clean" diesel engine and fuel system that will improve fuel efficiency by up to 40%. Existing police patrol fleet in 2005 had an average fuel economy of 22 mpg according to the 2005 Tiburon Greenhouse Gas Inventory. The Carbon Motors vehicle will have a combined city/highway fuel economy of 28-30 mpg. This estimate assumes a 30% improvement over 2005 patrol fleet fuel economy. Projected fuel savings assumes an average fuel cost of $3.50 per gallon.

Measure 3.2.G4: Offset Emissions from Town Vehicles

Projected Town vehicle emissions in 2020	128.25 metric tons
Emissions offset through other measures	36.12 metric tons
Remaining GHG emissions to offset	92.1 metric tons
Annual cost to offset vehicle emissions	$1,209

Data Source Notes and Assumptions: Assumes participation in TerraPass program at 2010 cost of $5.95 per 1,000 lbs. TerraPass is a private company that sells carbon offsets to balance vehicle emissions. TerraPass funds three different types of carbon reduction projects: clean energy produced by wind power; landfill gas capture, and methane reduction projects at farms. TerraPass offsets are verified annually against broadly accepted standards by independent third party verifiers. Their primary standards are the latest version of the Voluntary Carbon Standard (issued in 2008) and the Climate Action Reserve.

3.3 Green Building, Energy Efficiency and Renewable Energy

Measure 3.3.C1: Improve Energy Efficiency in 20% of Existing Residential Buildings

Number of occupied households, year 2005	3,760
Electricity use in residential sector, year 2005	32,005,155 kWh
GHG emissions from residential sector, year 2005	22,515 metric tons
Expected energy efficiency achieved	20%
Potential energy efficiency upgrade penetration	20%
Number of housing units improved	752
Estimated reduction in electricity use	1,280,206 kWh
Estimated GHG reduction in electricity use	300 metric tons
Total estimated GHG reduction	901 metric tons

Measure 3.3.C2: Improve Energy Efficiency in 20% of Existing Commercial Buildings

GHG emissions from commercial sector, year 2005	5,036 metric tons
Electricity use in commercial sector, year 2005	12,596,041 kWh
Expected energy efficiency achieved	20%
Potential energy efficiency upgrade penetration	20%
Estimated reduction in electricity use	503,842 kWh
Estimated GHG reduction in electricity use	124 metric tons
Total estimated GHG reduction	201 metric tons

Measure 3.3.C3: Reduce Energy Use in New Residential Construction

Projected number of new homes (including teardown and rebuilds), 2005-2020	80
Average residential electricity use per household, 2005 (kWh)	8,512 kWh
Average residential GHG emissions per household, 2005 (metric tons)	6.0 metric tons
15% reduction in electricity use due to CA 2008 Building Efficiency Standards 2010-2020	68,096 kWh
Additional 15% reduction from Marin Green BERST Standards 2010- 2020	68,096 kWh
Estimated reduction in electricity use (kWh)	136,192 kWh
15% reduction in energy use due to CA 2008 Building Efficiency Standards 2010-2020	48 metric tons
Additional 15% reduction from Marin Green BERST Standards 2010- 2020	48 metric tons
Estimated GHG reduction (metric tons)	96 metric tons

Data Source Notes and Assumptions: According to the CEC, the 2008 Building Efficiency Standards, which took effect on January 1, 2010, require, on average, a 15% increase in energy efficiency savings compared with the 2005 Building Efficiency Standards. California Energy Commission, 2009 Integrated Energy Policy Report, Final Commission Report, December 2009, CEC -100-2009-003-CMF, p.5. Marin Green BERST recommends an additional reduction from existing Title 24 Part 6 energy budget requirements for new single and two-family residential construction as follows: 500-3,999 sq. ft., 15%; 4,000 – 5,499 sq. ft., 20%; 5,500 – 6,999 sq. ft., 30%; over 7,000 sq. ft., net zero energy. The Marin Green BERST recommendation for new multi-family buildings is 15% below Title 24 energy budget requirements. This analysis assumes an average 15% across all residential building types. Every 1% increase over Title 24 requirements is assumed to result in a 0.2% decrease in electricity use and a 1% decrease in natural gas use.

Measure 3.3.C4: Reduce Energy Use in New Commercial Construction

Projected increase in GHG emissions in commercial sector 2005-2020	934 metric tons
Projected increase in electricity use in commercial sector 2005-2020	2,337,001 kWh
15% reduction in electricity use due to CA 2008 Building Efficiency Standards, year 2010-2020	233,700 kWh
Additional 10% reduction from Marin Green BERST Standards 2010- 2020	155,800 kWh
Estimated reduction in electricity use	389,500 kWh
15% reduction in energy use due to CA 2008 Building Efficiency Standards, years 2010-2020	93 metric tons
Additional 10% reduction from Marin Green BERST Standards 2010-2020	62 metric tons
Estimated GHG reduction	156 metric tons

Data Source Notes and Assumptions: According to the CEC, the 2008 Building Efficiency Standards, which took effect on January 1, 2010, require, on average, a 15 percent increase in energy efficiency savings compared with the 2005 Building Efficiency Standards. California Energy Commission, 2009 Integrated Energy Policy Report, Final Commission Report, December 2009, CEC -100-2009-003-CMF, p.5. Marin Green BERST recommends an additional 15% reduction from existing Title 24 Part 6 energy budget requirements for new commercial construction over 5,000 sq. ft. This analysis assumes an average 10% reduction across all commercial building sizes. Every 1% increase over Title 24 requirements is assumed to result in a 0.2% decrease in electricity use and a 1% decrease in natural gas use.

Measure 3.3.C5: Install Solar Energy Systems in 20% of Existing Residential Buildings

Annual electricity use in residential sector, year 2005	32,005,155 kWh
GHG emissions from residential electricity use, year 2005	7,489 metric tons
Number of households in 2005	3,790
Average annual residential energy use	8,512 kWh
% potential solar energy of total electricity use	85%
Potential solar system penetration	20%
Potential number of homes	752
Estimated electricity saved	5,440,876 kWh
Estimated GHG reduction	1,273 metric tons

Data Source Notes and Assumptions: Number of Tiburon households in 2005 is based on estimates provided by the Association of Bay Area Governments (ABAG) Projections 2009. As of 10/6/10, Tiburon has 127 installed solar energy systems and a total capacity of 684 kW or approximately 5.4 kW per system, the majority of which are residential systems (Marin Energy Management Team and California Solar Initiative data). This number represents approximately 3% of the existing 3,790 single family homes in Tiburon. Solar installation in Tiburon has occurred at a much greater rate than California (0.4%) and Marin County (1.1%).

Measure 3.3.C6: Install Solar Energy Systems in 15% of Existing Commercial Buildings

Annual electricity use in commercial sector in 2005	12,596,041 kWh
GHG emissions from commercial electricity use in 2005	3,099 metric tons
% potential solar energy of total electricity use	85%
Potential solar system penetration	15%
Estimated electricity saved	1,605,995 kWh
Estimated GHG reduction	395 metric tons

Measure 3.3.C7: 10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity

Projected electricity use in 2020	48,392,977 kWh
Less direct access electricity	1,725,202 kWh
Electricity use reduced by other measures	10,300,510 kWh
Electricity use added back for electric vehicles	76,506 kWh
Remaining electricity use	36,443,770 kWh
Projected Deep Green Electricity Use in 2020	10%
Projected Deep Green kWh in 2020	3,644,377 kWh
GHG emissions reductions	815 metric tons

Data Source Notes and Assumptions: Assumes 10% of all ratepayers will purchase deep green, 100% renewable energy in 2020. As of December 2010, Marin Energy Authority had enrolled approximately 4% of its Phase I customer prospects throughout Marin in the deep green option.

Measure 3.3.C8: 70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity

Projected electricity use in year 2020	48,392,977 kWh
Less direct access electricity	1,725,202 kWh
Electricity use reduced by other measures	10,300,510 kWh
Electricity use added back for electric vehicles	76,506 kWh
Remaining electricity use	36,443,770 kWh
Projected Light Green electricity use	25,510,639 kWh
GHG emissions reduction	5,133 metric tons

Data Source Notes and Assumptions: Assumes 70% of all PG&E ratepayers will purchase light green energy in 2020, and light green will be 90% renewable by 2020, as per Marin Energy Authority's projections. As of December 2010, Marin Energy Authority had enrolled approximately 76% of its Phase I customer prospects throughout Marin in the light green option.

Measure 3.3.C9: Offset Emissions for Natural Gas Use

Projected residential natural gas usage, year 2020	2,937,076 therms
5% natural gas usage reduced through offsets	146,854 therms
GHG emissions offset	751 metric tons

Data Source Notes and Assumptions: Assumes participation in PG&E's ClimateSmart program at 2009 costs of $0.06528 per therm. PG&E's ClimateSmart program allows customers to balance out the greenhouse gas emissions associated with their own natural gas and electricity use. Under the program, customers who participate are charged an extra $0.06528 per therm of natural gas, which is the volumetric rate set by the California Public Utilities Commission to make the GHG emissions associated with their home or business energy use "carbon neutral." The revenues from the program are used solely to invest in new GHG emission reduction projects in California, including forestry, dairy, and landfill methane capture that reduce or absorb GHGs such as carbon dioxide and methane. All of the GHG emission reduction projects are selected through a competitive solicitation with clear and stringent criteria and are independently verified under the rigorous protocols developed by the Climate Action Reserve (CAR), the successor organization to the California Climate Action Registry, to ensure the projects meet the commitment to make participating customers carbon neutral.

Measure 3.3.G1: Install Energy Efficiency Upgrades in Town Buildings

Energy-Efficiency Project	Reduction in Annual Electricity Use (kWh)	Reduction in Annual Natural Gas Use (therms)	Estimated Project Cost	Annual Energy Cost Savings	Reduction in GHG emissions (metric tons)
Install energy-efficient lighting in Town Hall	1,939	0	$1,470	$304	0.43
Install energy-efficient lighting in Police Station	68	0	$270	$11	0.02
Install energy-efficient lighting in Corp Yard	5,247	0	$1,734	$824	1.17
Replace split gas heat condensers in Police Station	2,216	450	$34,083	$419	2.90
Replace heat pumps in Police Station	14,717	0	$13,500	$2,310	3.29
Install vending machine controller	1,402	0	$130	$220	0.31
Install window film or shade screens in Town Hall	624	(20)	n/a	$75	0.03
TOTAL	26,213	431	$51,187	$4,163	8.16

Data Source Notes and Assumptions: Proposed energy-efficiency projects, estimated project costs net of rebates, and estimated energy savings based on Energy Management Study for the Town of Tiburon prepared by the Marin Energy Management Team on December 9, 2010.

Measure 3.3.G2: Install Solar Energy System at Town Hall

Facility	System Size KW AC	Annual kWh Produced	Annual kWh Produced	Project Cost	Annual Cost Savings	Reduction in GHG Emissions (metric tons)
Town Hall	12.23	40,416	3,749	Completed	$6,933	9.0

Data Source Notes and Assumptions: PV system data provided by Tiburon Planning Department. Annual electricity cost savings are based on an average of summer and winter rates of .17115 per kWh from PG&E's A-1 Electric Rate Schedule, effective June 1, 2010.

Measure 3.3.G3: Install Solar Energy System at Police Station

Facility	System Size KW AC	Annual kWh Produced	Annual kWh Produced	Project Cost	Annual Cost Savings	Reduction in GHG Emissions (metric tons)
Town Hall	11.0	18,557	3,749	$96,470	$3,183	4.2

Data Source Notes and Assumptions: PV system data provided by Tiburon Police Department. Annual electricity cost savings are based on an average of summer and winter rates of .17115 per kWh from PG&E's A-1 Electric Rate Schedule, effective June 1, 2010.

Measure 3.3.G4: Upgrade Street Lighting to Energy-Efficient Technologies: LED Retrofit

Lamp Type	Quantity	Annual Energy Use (kWh)	Annual Cost	GHG Emissions (metric tons)	Potential Replacement Lamp*	Annual Energy Use (kWh)	Annual Cost	GHG Emissions (metric tons)	Replacement Cost	Reduction in Annual Energy Use (kWh)	Reduction in Annual Operating Cost	GHG Emissions Reduction (metric tons)
HPS 50w	8	2,016	$246	0.45	LED 30w	902	$110	0.20	$3,960	1,114	$137	0.25
HPS 70w	223	77,604	$9,446	17.35	LED 42w	38,802	$4,723	8.67	$112,615	38,802	$4,723	8.67
HPS 100w	10	4,920	$599	1.10	LED 60w	2,352	$286	0.53	$5,610	2,568	$313	0.57
HPS 150w	33	23,760	$2,892	5.31	LED 99w	13,187	$1,605	2.95	$21,978	10,573	$1,287	2.36
HPS 200w	3	2,880	$351	0.64	LED 117w	1,444	$176	0.32	$2,028	1,436	$175	0.32
TOTAL	277	111,180	$13,534	24.86		56,687	$6,900	12.67	$146,191	54,493	$6,634	12.18

Data Source Notes and Assumptions: Potential replacement lamps and estimated installation costs provided by Republic ITS for illustrative purposes only; actual replacement lamps will require further analysis. Costs assume that all fixtures are 120 volts and all fixtures are cobra heads, since material pricing and wattages vary based on the style of the fixture. Annual energy usage and costs provided by Marin Energy Management Team, Energy Management Study for the Town of Tiburon, December 9, 2010.

Measure 3.3.G5: Purchase Energy-efficient Appliances

Equipment	Quantity	Estimated Installation Cost	Estimated Annual Energy Saving Per Unit (kWh)	Annual Energy Savings (kWh)	Annual Energy Cost Savings	Reduction in GHG Emissions (metric tons)
Refrigerators	3	$1,950	405	1,214	$209	0.27

Data Source Notes and Assumptions: Recommended appliance upgrade, installation cost, and annual energy usage and cost savings provided by Marin Energy Management Team, Energy Management Study for the Town of Tiburon, December 9, 2010.

Measure 3.3.G6: Purchase Marin Clean Energy Deep Green Electricity for Government Facilities

Projected electricity use in year 2020	415,160 kWh
Electricity use reduced by other measures	140,893 kWh
Electricity use added back for electric vehicles	1,800 kWh
Deep Green electricity purchase	276,067 kWh
Annual Deep Green electricity cost	$2,761
GHG emissions reduction	61.7 metric tons

Data Source Notes and Assumptions: Assumes 2010 deep green electricity cost of $0.01 per kWh.

Measure 3.3.G7: Offset Emissions from Natural Gas Use

Projected natural gas usage, year 2020	2,734 therms
Natural gas usage reduced through other measures	429 therms
Remaining natural gas usage to be offset	2,305 therms
Annual cost to offset natural gas	$150
GHG emissions to be offset	12.6 metric tons

Data Source Notes and Assumptions: Assumes participation in PG&E's ClimateSmart program at 2009 costs of $0.06528 per therm. PG&E's ClimateSmart program allows customers to balance out the greenhouse gas emissions associated with their own natural gas and electricity use. Under the program, customers who participate are charged an extra $0.06528 per therm of natural gas, which is the volumetric rate set by the California Public Utilities Commission to make the GHG emissions associated with their home or business energy use "carbon neutral." The revenues from the program are used solely to invest in new GHG emission reduction projects in California, including forestry, dairy, and landfill methane capture that reduce or absorb GHGs such as carbon dioxide and methane. All of the GHG emission reduction projects are selected through a competitive solicitation with clear and stringent criteria and are independently verified under the rigorous protocols developed by the Climate Action Reserve (CAR), the successor organization to the California Climate Action Registry, to ensure the projects meet the commitment to make participating customers carbon neutral.

3.4 Waste Reduction, Recycling and Zero Waste

Measure 3.4.C1: Divert All Food Waste from Landfill

Projected waste in 2020	9,081 tons
Food waste in year 2020	1,503 tons
GHG emissions reduced	413 metric tons

Data Source Notes and Assumptions:
Estimated food waste based on the CIWMB 2004 Statewide Waste Characterization Study. This state average waste characterization accounts for residential, commercial and self-haul waste. http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097

Government Operations Goal 3.4.G2: Switch to 30% Recycled Paper

CACP	CIWMB	% of Total	Methane Emissions (metric tons / short ton of waste)
Paper Products	All paper types	21	1.940
Food Waste	Food	14.6	1.098
Plant Debris	Leaves and Grass, Prunings and Trimmings, Branches and Stumps, Agricultural Crop Residues, and Manures	6.9	0.622
Wood/Textiles	Textiles, Remainder/Composite Organics, Lumber, and Bulky Items	19.8	0.549
All Other Waste	The other category includes all inorganic material types reported: Glass, Metal, Electronics, Plastics, Non-organic C&D, and Special/ Hazardous Waste.	37.7	0.000

The 75% methane recovery factor is derived from the Local Government Operations Protocol, Chapter 9. The methane emission factors used in ICLEI's CACP Software were derived from the EPA WARM model. For quantification of emissions, only methane generation (or gross Tiburon emissions) is taken into account. These emissions are estimated to take place over an extensive (up to 100 year) cycle, as anaerobically degradable organic carbon decomposes in a landfill. More information on the WARM Model is available at: http://epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

Measure 3.4.C2: Reduce All Other Solid Waste Disposal to Landfills by 25%

Projected waste in year 2020	9,081 tons
Food waste diverted	1,503 tons
Remaining landfilled waste in year 2020	7,577 tons
GHG emissions from remaining waste	1,822 metric tons
25% reduction in remaining waste	456 metric tons

Measure 3.4.G1: Reduce Solid Waste Disposal to Landfill by 25%

Projected waste in 2020	151.2 tons
GHG emissions from waste in 2020	38.4 metric tons
25% reduction in GHG emissions	9.6 metric tons

Data Source Notes and Assumptions: Waste Characterization based on California Integrated Waste Management Board (CIWMB), derived specifically for the "Public Administration" sector, using the Business Waste Characterization portion of the CIWMB 1999 Statewide Waste Characterization Study: http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.asp

CACP	CIWMB	Percent of Total
Paper Products	All paper types	39.4
Food Waste	Food	9.8
Plant Debris	Leaves and Grass, Prunings and Trimmings, Branches and Stumps, Remainder/Composite Organic	17
Wood/Textiles	Textiles (Under "Other Organic"), Lumber (Under "Construction and Demolition"), Remainder/Composite Construction and Demolition	6.7
All Other Waste	The other category includes all inorganic material types reported: Glass, Metal, Electronics, Plastics, Non-organic C&D, and Special/Hazardous Waste.	27.1

3.5 Water and Wastewater

Measure 3.5.C1: Reduce Water Use in Community by 15%

Per capita water use per day, FY 05/06	139 gallons
Water use in year 2005	446,468,000 gallons
Projected water use in year 2020	466,762,000 gallons
Indoor, hot water use	93,819,162 gallons
15% reduction in hot water use	14,072,874 gallons
Reduction in natural gas use	79,990 therms
Reduction in electricity use	1,123,015 kWh
Estimated reduction in GHG emissions	679 metric tons

Data Source Notes and Assumptions: Per capita water use in Marin Municipal Water District FY 2005/2006 was 139 gallons per day, MMWD Report on Water Production and Related Statistics, June 30, 2008, p.12. Indoor water use assumed to be 67% of total water use (Dan Carney, MMWD) and hot water use 30% of indoor water use (EBMUD Indoor Water Conservation Study (p. 31), 2003; see http://www.ebmud.com/about_ebmud/publications/technical_reports/residential_indoor_wc_study.pdf). Analysis assumes 0.0098 therms to heat one gallon of water, 0.19 kWh to heat one gallon of water, and 58% of hot water heaters use natural gas (ICLEI CAPPA Beta).

3.6 State Actions

Measure 3.6.C1: PG&E Achieves 33% Renewable Portfolio Standard by 2020

Projected community electricity use in year 2020	48,392,977 kWh
Less direct access electricity	1,725,202 kWh
Electricity use reduced from other measures	39,455,527 kWh
Electricity use added back for electric vehicles	76,506 kWh
Remaining electricity usage	7,288,754 kWh
GHG emissions with year 2005 PG&E emission factor	1,629 metric tons
GHG emissions with projected year 2020 PG&E emission factor	852 metric tons
Estimated reduction in GHG emissions	778 metric tons

Data Source Notes and Assumptions: Projected 2020 PG&E CO_2e emission factor of 0.25763 is based on PG&E's 2005 electric power mix as follows: 12% from renewable sources; 20% from large hydro; 24% from nuclear; 42% from natural gas; 1% from coal; and 1% from other GHG-emitting sources. Analysis assumes additional 21% renewable energy will displace GHG-emitting sources in the electric power mix. Many variables will affect the actual 2020 emission factor, including the availability of large hydro and nuclear electricity sources, and the GHG reduction potential calculated here assumes conditions will be similar to 2005.

Measure 3.6.C2: AB 1493 Pavley Standards

California transportation emissions, year 2020	225.4 $MMTCO_2e$
Expected reduction in emissions under phase one	16.4 $MMTCO_2e$
% reduction	7.28%
Community transportation emissions, projected year 2020	26,351 metric tons
GHG emissions reduced by other measures	1,284 metric tons
Remaining GHG emissions	25,067 metric tons
Estimated reduction in GHG emissions	1,824 metric tons

Data Source Notes and Assumptions: California Air Resources Board, "Climate Change Scoping Plan: A Framework for Change," December 2008, p. 13. California Air Resources Board, "Comparison of Greenhouse Gas Reductions for the United States and Canada under U.S. CAFE standards and California Air Resources Board Greenhouse Gas Regulations," Feb. 25, 2008, p. 13, http://www.energy.ca.gov/2008publications/ARB-1000-2008-012/ARB-1000-2008-012.PDF.

Measure 3.6.C3: Low Carbon Fuel Standard

California transportation emissions, year 2020	225.4 $MMTCO_2e$
Expected reduction in emissions	15 $MMTCO_2e$
% reduction	6.65%
Community transportation GHG emissions, projected year 2020	26,351 metric tons
GHG emissions reduced by other measures	1,284 metric tons
Remaining GHG emissions	25,067 metric tons
Estimated GHG emissions reduction	1,668 metric tons

Data Source Notes and Assumptions: California Air Resources Board, "Climate Change Scoping Plan: A Framework for Change," December 2008, pp. 13 and 17.

Measure 3.6.G2: AB 1493 Pavley Standards

California transportation emissions, year 2020	225.4 $MMTCO_2e$
Expected reduction in emissions under phase one	16.4 $MMTCO_2e$
% reduction	7.28%
Local government transportation emissions, year 2020	238.2 metric tons
GHG emissions reduced by other measures	32.2 metric tons
Remaining GHG emissions	206.0 metric tons
Estimated reduction in GHG emissions	15.0 metric tons

Measure 3.6.G3: Low Carbon Fuel Standard

California transportation emissions, year 2020	225.4 $MMTCO_2e$
Expected reduction in emissions	15 $MMTCO_2e$
% reduction	6.65%
Local government transportation emissions, year 2020	238.2 metric tons
GHG emissions reduced by other measures	32.2 metric tons
Remaining GHG emissions	206.0 metric tons
Estimated reduction in GHG emissions	13.7 metric tons

APPENDIX B

Summary of Recommended Actions

Recommended Community Actions

Measure		GHG Reductions (Metric Tons)
3.2.C1	Encourage Transit-oriented Development and Workforce Housing	13
3.2.C2	Increase Walking and Biking for Local Trips	524
3.2.C3	Increase Public Transit Use	535
3.2.C4	Increase Ridesharing	63
3.2.C5	Accelerate Adoption of Electric Vehicles	149
3.3.C1	Improve Energy Efficiency in 20% of Existing Residential Buildings	901
3.3.C2	Improve Energy Efficiency in 20% of Existing Commercial Buildings	201
3.3.C3	Reduce Energy Use in New Residential Construction	82
3.3.C4	Reduce Energy Use in New Commercial Construction	119
3.3.C5	Install Solar Energy Systems in 20% of Existing Residential Buildings	1,273
3.3.C6	Install Solar Energy Systems in 15% of Existing Commercial Buildings	395
3.3.C7	10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity	815
3.3.C8	70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity	5,133
3.3.C9	Offset Emissions for 5% of Natural Gas Use	751
3.4.C1	Divert All Food Waste from Landfill	413
3.4.C2	Reduce All Other Solid Waste Disposal to Landfills by 25%	456
3.5.C1	Reduce Water Use in Community by 15%	679

Recommended Government Operations Actions

Measure		Cost to Implement	Annual savings	GHG Reductions (Metric Tons)
3.2.G1	Replace Town Vehicles with Hybrid or Electric Vehicles	As replaced	$2,200	6.0
3.2.G2	Encourage Town Employees to Commute by Alternative Means of Transportation	Variable	n/a	11.0
3.2.G3	Replace Police Patrol Cars with More Fuel-Efficient Vehicles	As replaced	$6,000	15.2
3.2.G4	Offset Emissions from Town Vehicles	$1,200 per year	n/a	92.1
3.3.G1	Install Energy Efficiency Upgrades in Town Buildings	$51,200	$4,200	8.2
3.3.G2	Install Solar Energy System for Town Hall	Completed	$6,900	9.0
3.3.G3	Install Solar Energy System for Police Station	$96,500	$3,200	4.2
3.3.G4	Upgrade Street Lighting to Energy-efficient Technologies (LED)	$146,200	$6,600	12.2
3.3.G5	Purchase energy-efficient Appliances	$1,950	$200	0.3
3.3.G6	Purchase Marin Clean Energy Deep Green Electricity for Government Facilities	$2,800 per year	n/a	61.7
3.3.G7	Offset Emissions for Natural Gas Use	$150 per year	n/a	12.6
3.4.G1	Reduce Solid Waste Disposal to Landfill by 25%	n/a	n/a	9.6